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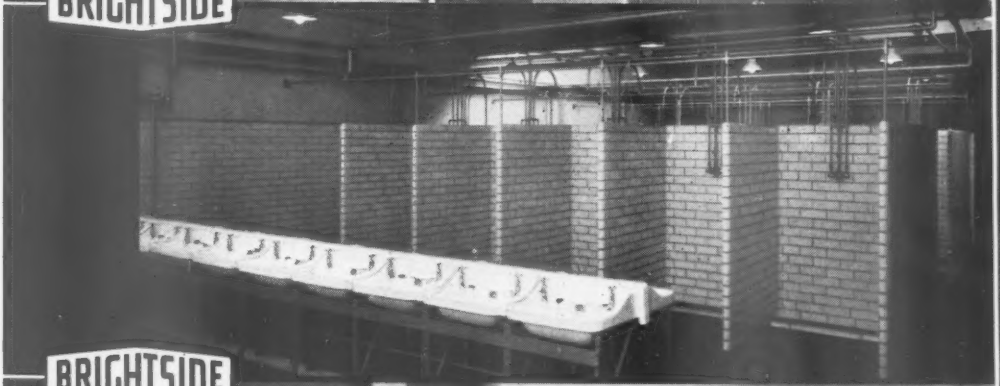

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PRINCIPAL CONTENTS

Technical :

PAGE

Fluidity Testing Developments, by V. Kondic, B.Sc., Ph.D.: A brief survey of available data is followed by a consideration of foundry aspects of fluidity, the Author introducing among recent developments his own design of test-piece. An assessment is made of the fluidity test as a foundry control tool, and a report of the ensuing discussion is given 31

Foundrymen's Dislikes: Report of an unconventional presidential address 39

Shanks and Ladles, by "Jaques" Developments in metal pouring, from "catching at the spout" to the use of one-man pouring units 45

Pig-iron and Steel: Survey of changes in 1955 49

Features :

Leader: Not Too Little, not Too Much: . . 30
New Year Honours 37
New Patents 48
Forthcoming Events and Publications 48
Received (Advert. section) 34

Commercial :

Scottish Light Iron Castings Review . 43
Company News 48
Contracts Open 51
Pig-iron and Steel Production . . 54
Raw Material Markets 58
Current Prices of Iron, Steel and Non-ferrous Metals (Advert. section) . . 33

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Not Too Little, not Too Much

In the last issue of *Gray Iron News** to reach us, there is an article which lists a number of variables arising in ironfoundry practice, together with what happens if any one of them is too large or too much or too little or too small. To take just four examples: (*a*) A taphole too long results in a hard tap, whilst one too short burns out too soon; (*b*) too much coke used in the cupola gives a slow melting rate, whilst too little will result in cold iron; (*c*) excessive hot-strength in a moulding sand results in casting cracks or hot-tears, whilst too low a strength causes "cuts" and washes; (*d*) moulding boxes which are too large for the job involves longer filling time, whilst those which are too small make moulding difficult and are a source of potential run-outs. Whilst 69 of these variables are given, there are obviously dozens of others.

This listing is extremely interesting, as it is clear that most of the variables can be controlled. There are, however, a few which must be left to the discretion of the man on the job. With the case of slagging off a ladle, for instance, if too much time is taken the metal may get "cold," whereas if slag removal is skimped, "dirty" castings may result. A second case is the dimensioning of runners and risers in a jobbing shop—here again, only the personal experience of those handling the job can govern decisions, even though the results of over and under estimating are well known. The choice of a runner-basin, for example, will, if too big, result in lower casting yield, and involve difficulties in handling and removal, whilst if too small there will be interrupted pouring, metal splashing and slag entering the runner or maybe the casting.

The success of a foundry must depend on the control of as many variables as possible. This does not mean that it is only the most highly mechanized concerns that enjoy the maximum of control. A jobbing shop which is not too big may be better controlled, even though it be based on experience and empiricism, than the larger concerns. The difference is that in the latter case, if the system is set out in black and white, the manager can take a holiday knowing that there is every chance of proper production being continued. This is not the case where complete reliance has to be placed on the "boss's" judgment. Thus the obvious lesson to be learned from a study of these 69 variables is the necessity of establishing constants, and it should be remembered that most can be resolved by two sets of apparatus—weighing machines and a sand-testing outfit. It is quite distressing to learn that, even to-day, quite a high percentage of foundries operate their cupolas without any weighing machine. The larger concerns should also examine their innumerable variables to ascertain which are and are not under control.

* House organ of the Gray Iron Founders' Society (USA).

Council's Ten Restrictions

Subject to the firm giving certain undertakings, Smethwick Town Council on January 3 approved an application by the Midland Motor Cylinder Company, Limited, for permission to erect a foundry on land at Dartmouth Road, Smethwick. The assurances, which have regard to the elimination of nuisance from smoke, dirt, and noise are:—

That wet-type spark-arresters would be fitted to the new cupolas and also, at a later date, to the existing cupolas.

That steel scrap would not be used in the melt of the new cupolas.

That hot-blast equipment would not be used.

That all dust-extraction plant would be of the wet type.

That exhaust chimneys from core stoves, etc., would be at a height at least 50 per cent. greater than the height of the adjacent houses.

That compressor noise would be reduced by the use of air-intake silencers and that the compressor would not be fitted with a high-pressure release.

That it was not intended to work a foundry night shift.

That vibration from "shake-outs" would be dealt with in such a manner that any nuisance to adjacent houses would be eliminated

That the corner of the main building nearest the railway side would be used as an inspection department.

That on completion the company would agree to members of the appropriate committees inspecting the plant.

New Steel Company of Wales Managers

Managerial changes announced by the Steel Company of Wales, Limited, include the appointment of Mr. P. A. Mackay as manager of the Abbey melting shop. He joined the company in 1934 and now leaves the post of manager of the Margam melting shop, to which he was appointed in 1943. He is succeeded at Margam by his assistant manager, Mr. R. H. Pullen, who has held that appointment since 1950. Mr. Pullen began his career at Margam and was a sample passer for 25 years.

Mr. F. McGurk, assistant manager of the Port Talbot melting shop, becomes assistant manager of the Margam shop and the new assistant manager of the Abbey melting shop is Mr. P. D. Higgins, technical assistant to the melting shops superintendent.

In the engineering department, Mr. J. S. Thomas becomes co-ordination engineer, and Mr. J. N. Evans and Mr. J. C. Lewis assistant co-ordinators.

Rating and Valuation (No. 103)

The *General Bulletin* of the Council of Ironfoundry Associations states that the new valuation lists should by now be available for inspection at the offices of the local authorities in England and Wales. First reports indicate that new valuations are substantially higher than those previously made in 1934.

Foundry concerns should inspect the lists at the earliest opportunity to ascertain what changes have been made in respect of their premises. Appeals against the new valuations cannot be made until after April 1, 1956. This delay will enable local authorities to consider the effect of the new valuations and to fix the rates for 1956-57 in the light of the increased value of their properties.

Capper Pass Awards

The adjudicating committee, representing the Councils of the Institution of Mining and Metallurgy and of the Institute of Metals, have made the following Capper Pass Awards in respect of papers before those bodies for the year 1954.

£100—Mr. G. Lawrie Fairs, for a paper on "A Method of Predicting the Performance of Commercial Mills in the Fine Grinding of Brittle Materials."

£100—Mr. F. King and Dr. A. N. Turner, for "The Control of Quality in the Hot- and Cold-rolling of Aluminium and Aluminium Alloys."

£50—Mr. G. L. Hopkin, Mrs. J. E. Jones, Mr. A. R. Moss and Mr. D. O. Pickman, for "Arc Melting of Metals and its Application to the Casting of Molybdenum."

£50—Professor M. Rey, for "Flotation of Oxidized Ores of Lead, Copper and Zinc."

The Capper Pass Awards are made from a fund placed at the disposal of the Councils of the two societies by the directors of Capper Pass & Son, Limited, for the encouragement of the publication of scientific and technical papers dealing with processes and plant used in exraction metallurgy, and on the subject of assaying and of papers and processes used in all branches of the non-ferrous metal industry.

Dutch Steelworks Expansion

A large development programme has been approved by the directors of the Royal Netherlands Blast Furnaces and Steel Factories. The programme provides for the building of a fourth blast furnace, an increase in crude steel capacity, and big outlays in the rolling mills and harbour installations.

When this expansion is completed in the first half of 1958, pig-iron output will be increased from the present 600,000 tons to about 1,000,000 tons a year, and crude steel output from 600,000 to 1,100,000 tons.

Production of the Royal Netherlands Blast Furnaces and Steel Factories in the 12 months ended November was:—

Coke, 464,000 tons (451,000 tons in the previous 12 months); pig-iron, 672,000 (609,000) tons; steel blooms, 680,000 (681,000) tons; thick plates, 252,000 (238,000) tons; steel in rolls, 536,000 (384,000) tons; cold- and hot-rolled sheets, 282,000 (188,000) tons; tinplate, 61,000 (41,000) tons; nitrogen, 78,000 (same) tons; cement, 345,000 (315,000) tons.

Latest Foundry Statistics

According to the Ministry of Supply the output of aluminium castings during October last was 1,852 tons from sand moulds; 4,368 as gravity-die- and 1,608 as pressure-die-castings. During this month 396 tons of magnesium were made.

MR. SYDNEY BARLOW, manager of the bridge and constructional works at Middlesbrough of Dorman Long (Bridge & Engineering), Limited, has been appointed general manager of the structural activities of the company, covering sales, the Brittania constructional works, the London (Nine Elms) constructional works, and the erection and stockyard departments. Mr. Barlow is a director of the company. He joined the parent concern, Dorman Long & Company, Limited, as an apprentice in 1917, and was appointed a special director of the company in 1952.

Fluidity Testing Developments*

By V. Kondic, B.Sc., Ph.D.

The objectives of the Paper are, first to survey briefly the available data that have been obtained by various fluidity tests and then to deal with some more recently suggested type of fluidity tests, particularly in relation to two questions of which test to choose and what practical use can be made of the results. A report of discussion on the Paper is appended.

Terminology

Fluidity is a term that has been used by foundrymen for a long time and yet there is at present no generally accepted definition of this term. The main divergence of views is centred around the question—whether the definition should embrace the properties of the metal only, or both the metal and the mould. Thus, some authors define the fluidity as: "the ability of a metal to flow freely in a mould," whilst others add to this definition: "and to give a perfect reproduction of the pattern."

A survey of past studies of dealing with the subject of fluidity leads to the conclusion that in most cases it was the metal side of fluidity that received the attention of investigators. The mould has been considered only as a modifying factor affecting the fluidity of a given alloy. A whole series of different fluidity tests has been developed (this subject has been recently adequately reviewed[1,2]), and two outstanding questions emerge. First, it is not clear which type of fluidity test could be recommended for a specific application, and secondly, for what practical uses on the foundry floor could a fluidity test be applied.

Metallurgical Aspects

The fact that the term fluidity as used by foundrymen is not a physical term (*i.e.*, not an inverse of viscosity), has been long recognized by metallurgists. Consequently they have striven, in collaboration with foundrymen, to develop a test to measure the property of fluidity in a manner that would have some bearing on founding of metals. It is not surprising, therefore, that the test which is most commonly used nowadays for fluidity measurement depends on making a two- or three-part sand mould. This mould carries a groove in the form of a spiral which is connected to a suitable gating system. The length to which the metal runs along such a spiral under the given conditions of the test, is used as the index of fluidity for a given metal.

Early investigators have recognized the fact that the spiral test is subject to great experimental scatter in results, unless both the moulding and pouring conditions are rigidly controlled. This factor has persisted right up to the present time and may well be responsible for the lack of acceptance of the spiral test on the foundry floor in general practice. (This point is dealt with at greater length subsequently.) Metallurgists have found, on the other hand, little difficulty in making good research use of the spiral fluidity test, under laboratory conditions of control, and particularly to study the properties of the metal and the mould which affect the fluidity index as empirically defined by the spiral test.

(*a*) *Fluidity and Constitution of Alloys.*

One of the very early uses of the fluidity spiral test was that of investigating the relation of fluidity to the alloy constitution. It is well known that some alloys are good casting alloys, whilst the production of shaped castings in others is more difficult. The reasons for this observation are manifold, but it is interesting to note that the fluidity-spiral test "uncovers" such a separation of alloys into two groups quite clearly. This is shown in the findings obtained by fluidity testing, that alloys having a short freezing range (generally good casting alloys) give also a high spiral-fluidity value. Alloys which solidify over a temperature interval (generally more difficult casting alloys), give, however, an inferior spiral-fluidity value.

Full reasons for such a relation of the fluidity to the alloy constitution have by no means been completely cleared. According to the one school of thought the main reason for the inferior fluidity of long-freezing-range alloy is to be found in the fact that these alloys solidify by passing at one stage through a pasty state which hinders the flow. Short freezing range alloys do not pass through such a pasty range. That this explanation does not give the full story could be seen from the fact that with many alloys, the hypereutectic (and long freezing) alloys possess greater spiral fluidity than the eutectic alloys. The other school of thought emphasizes the fact that viscosity, heat capacity and surface tension of alloys may play an overriding part in determining the fluidity value.

(*b*) *Fluidity and Pouring Temperature*

Another general conclusion obtained from the metallurgical research on fluidity is that with any given alloy the length of the fluidity spiral increases regularly with the pouring temperature. The practical significance of this observation is twofold: first, the fluidity test could be used as an indication of temperature, and secondly, the simplest way of ensuring adequate fluidity in foundry practice is that of raising the pouring temperature. This latter conclusion has long been recognized by foundrymen.

---

*Paper presented to the Birmingham Branch of the Institute of British Foundrymen, Mr. E. Dunning presiding. The Author is attached to the University of Birmingham.

Fluidity Testing Developments

The two relations briefly summarized above do not by any means exhaust all the interesting data that have been obtained by metallurgical investigations of fluidity. Such a complete review would be, however, outside the scope of the present paper.

Foundry Aspects of Fluidity

Metallurgical observations such as outlined above are obviously of great interest to foundrymen. However, neither of the two important observations described, could justify the application of a fluidity test as a foundry control test. First, when the composition of an alloy is once selected (on various grounds, including the fluidity), the question of further fluidity testing does not arise. Secondly, whilst it is true that in principle the fluidity test could be used to indicate the metal temperature, the issue has to be faced, whether the spiral test could be relied upon as much as the thermocouple? The question of making use of the fluidity test for temperature measurement remains therefore still open.

In relation to the composition of the alloy, foundrymen have, however, a definite interest in fluidity, although not perhaps that concerning the effects of major alloying elements. It is a familiar foundry observation that fluidity of an alloy may vary, in spite of the fact that the major composition of the alloy is well within the specifications limits. Such a melt condition is generally referred to by foundrymen as "melt quality." Under this term it is implied that the melting technique and similar factors may alter the molten metal quality, to the detriment of the fluidity of the alloy. For example, the presence in the alloy of impurities not normally analysed chemically (S, O, N, C, etc.) may have in some cases a decisive effect on the fluidity of the alloy. Consequently, the possibility of the use of the fluidity test on the foundry floor, as a melt quality control test is also still open.

Briefly, from the foundrymen's point of view, the question is not only whether to use or not to use the fluidity test, but even more so, which test to use and to what purpose?

Recent Developments

The application of the fluidity-spiral test on the foundry floor has not met with great success. First, the test requires a laboratory high standard of control in execution in order to obtain reasonable reproducibility in results. Secondly, its sensitivity to the melt quality lies well within the range of experimental scatter. More recently some investigators have replaced sand with shell moulding in fluidity testing in order to obtain a more highly repreducible mould[3]. This is, no doubt, a great step forward and may well be the correct solution for fluidity testing in some cases.

A reproducible mould is, however, only one of many factors affecting the spiral fluidity sensitivity. Both the method and the speed of pouring remain still as possible causes for high experimental scatter. This is one of the reasons why the Author has come to the conclusion that the spiral fluidity test is not, as used at present, the best choice for a control test of fluidity in the foundry floor. However, there is yet another and even more potent reason for arguing for a fresh approach in fluidity testing. The spiral fluidity test may well give an indication of the ability of the alloy to flow, but it does not necessarily reveal the ability of the alloy to fill the mould fully and particularly to reproduce finer details of the pattern. And this is surely what the fluidity test is mainly intended for. In addition the test should indicate the ability of an alloy to avoid the production of defective castings mainly through the loss of metal quality.

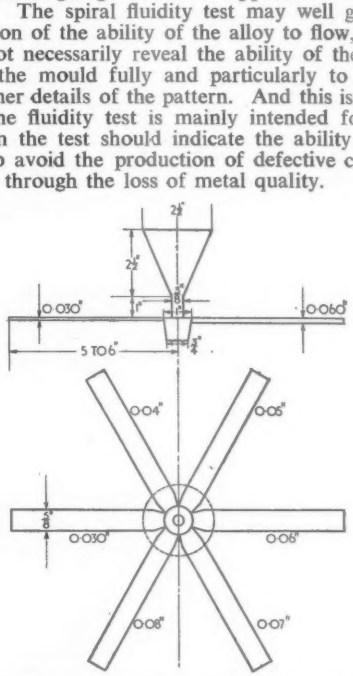

FIG. 1.—*Sketch of the star-type of fluidity test-piece developed by the Author.*

Recommendations for use of the "star" test-piece:—(*a*) *Moulding:* Use the CO$_2$ Process if available (alternatively core sand or green sand); two- or three-part mould; fine sand if available. (*b*) *Gating and Pouring:* Use no choke in the gating system. Fill two-thirds of the pouring cup quickly and from a constant height. (*c*) *Evaluation:* Compare the total length of arms that do not run fully. Alternatively measure the total length of all arms. (*d*) *Dimensions:* Main dimensions could be altered to obtain higher sensitivity. (*e*) *Applications:* "Trouble-shooting," checking metal temperature or composition.

The type of fluidity test which is suggested by the Author, and shown in Fig. 1, has the shape of a star. The metal is poured directly into a conical pouring basin, wherefrom it runs into a well and then simultaneously into a number of strips of the test piece, the strips being of differing thickness. The length and thickness of the strips are selected for a given alloy and normal pouring temperature range mainly from the point of view of obtaining most strips utilized during the test. The total length of strips produced can be used as the index of fluidity of the alloy.

(a) Reproducibility of the Star Fluidity Test.

The mould which is used for the test can be made in a number of ways, but one of the simplest methods of obtaining a reasonably reproducible

mould is that of using the CO_2 Process. A number of moulds were made in this way and were used for: showing the degree of experimental scatter, as well as the sensitivity of the test to the pouring speed and height and mould level. With the mould cast under identical conditions the total length of strips obtained differed by ± 0.25 in. In order to obtain such a high reproducibility, the metal has to be poured so fast that the downrunner is quickly filled and also during the filling the position-level of the crucible lip should not vary more than ± 0.5 in. These preliminary results were considered sufficiently satisfactory to extend the use of the test for examining the effects of some of the metal and foundry variables on fluidity.

(b) Effect of Mould Variables.

A few tests were carried out using different types of moulding sands, both green and dry, as well as different mould coatings. These tests showed that the surface roughness is an important variable controlling the fluidity results obtained by the star test. This feature is being further studied.

(c) Effect of Pouring Temperature.

One of the most frequent causes for the lack of fluidity of an alloy on the foundry floor lies in an inadequate pouring temperature. This is so much so, that views can be found in the technical literature, that the control of the pouring temperature is all that has to be controlled with respect to the question of fluidity. Such views cannot be readily accepted: first, the choice of the pouring temperature is controlled frequently by additional considerations apart from fluidity (*e.g.* surface quality and hot shortness) and secondly, by raising the pouring temperature there is the danger of obtaining a casting that looks satisfactory from outside, but whose properties are not satisfactory.

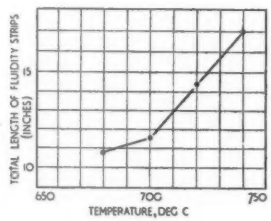

FIG. 2.—*Effect of pouring temperature on the fluidity of aluminium alloy LM4.*

Most fluidity tests that have been described in the literature are sensitive to the pouring temperature. The proposed star test reveals the relationship shown in Fig. 2. This graph shows (and similar graphs were obtained in a number of additional measurements that have been carried out) that the proposed fluidity test is sensitive to ± 10 deg. C. of the pouring temperature in the light-alloy range, and to ± 15 deg. C. in the copper-alloy and grey-iron range. No similar tests have been carried out as yet with steels.

(d) Metal Quality.

The primary aim of the proposed test was not that of indicating the temperature of the molten metal, but rather that of testing for molten-metal quality. The work in this field is far from being completed and one of the objects of the present Paper is that of stimulating further interest in the question. Some of the results that have been already obtained are summarized here briefly.

(i) Repeated Melting and Holding Time.—Some preliminary experiments were carried out in this field with the light alloy LM 4. In the first case the alloy was melted repeatedly and ingotted six times and fluidity measured each time, and in the second case, the alloy was held for 63 hours, without a cover, in an electric resistance furnace at 790 deg. C. In both cases the fluidity of the alloy as measured by the star test was reduced by the treatment, *viz.* by 1 in. in the first and 2.25 in. in the second case.

(ii) Gas Content and Grain Refining.—LM 4 alloy was used for these experiments, too. It was found that the fluidity is unaffected by the gas content of the alloy, and that grain refining by adding 0.1 per cent. Ti to the alloy, slightly raised the fluidity value (by 0.75 in.).

(iii) Modification of Al/Si Eutectic Alloy.—LM 6 or Silumin is frequently required to be fully modified for different applications. But both, under and overmodified structures are encountered as hazards in the foundry practice. It is therefore of interest to obtain the fluidity variation of Silumin in relation to the modification procedure. A charge was modified in the normal manner (using 3 per cent. flux method) and the fluidity test was taken as function of time after applying the flux. The results show that the fluidity decreased with the time after the flux was applied, then reached a minimum and subsequently increased again. An examination of the alloy structure revealed that the point of minimum in fluidity coincides with the time of optimum degree of modification of the structure.

(iv) Deoxidation of Leaded Bronze.—Melting under an oxidizing atmosphere and deoxidizing with phosphor-copper before pouring is a frequently used melting procedure for various types of bronzes. It is of interest to compare the fluidity of bronze before and after deoxidation. The alloy chosen was 85/5/5/5 leaded bronze. A charge was melted in a high frequency furnace, without cover and the fluidity was taken. After deoxidation with 0.1 per cent. P the fluidity was taken again. The latter fluidity value was by 3 in. longer than the former when taken at the same temperature.

(e) Composition of the Alloy

The composition of the alloy is determined in foundry practice normally by either physical or chemical laboratory methods. It is very useful, however, to be able to check up the major alloying content of the alloy by quick, composition control tests on the foundry floor. One of the best examples of such a test is the chill test for assessing

Fluidity Testing Developments

the carbon equivalent of grey iron. In order to check the possibility of using the fluidity test for measuring the carbon equivalent of cast iron, several tests of measuring the fluidity of cast iron were carried out. Three different irons were used, the composition and corresponding fluidities of which at four different temperatures are given in Table I.

TABLE I.—*Fluidity Tests of Three Cast Irons at Decreasing Temperatures.*

No.	Composition, per cent.			Fluidity (in.) at temperature deg. C.		
	C	Si	1360	1330	1300	12,800
1	3.54	1.93	21.5	19.75	18.25	14.25
2	3.56	1.57	20.2	19.2	17.2	12.1
3	3.14	1.90	17.8	15.1	12.1	6.8

The results shown in Table I reveal both the importance of carbon content as well as that of the pouring temperature on fluidity. The results obtained by fracturing the strips of the fluidity test show that it would be possible to calibrate the fracture in terms of the Carbon Equivalent (*i.e.*, the chilling tendency) of cast iron.

Current Assessment of the Fluidity Test as a Foundry Control Tool

In order that a fluidity test could be used on the foundry floor, as distinct from the laboratory use, it should satisfy the following two requirements: (*a*) it should give readily reproducible results and (*b*) it should be sensitive to the melt quality or some other selected variable (*e.g.*, metal composition or temperature). The test described appears to meet the above two requirements reasonably well, although much more work remains to be done, particularly that relating the fluidity to the melt quality.

One of the major problems which has to be faced with any type of fluidity test is the question of fluidity sensitivity to the pouring temperature. Clearly the fluidity test could be used to indicate the metal temperature for a metal of a known composition, or, when the temperature is otherwise measured in the foundry, either the metal quality or composition could be assessed. This has been shown to be true for a small number of alloys that have been studied so far.

Such a sensitivity of fluidity tests to two variables simultaneously, *viz.*, metal composition and temperature has been taken by some authors for a sufficient reason to discard the fluidity test as a possible foundry-floor-control test. Such a view cannot be justified and for a number of reasons. For example, it is frequently valuable to check up in a foundry whether the metal is satisfactory for pouring. In such a case the fluidity test could be used as a rapid test, although the cause for the lack of fluidity may have to be determined by further tests. Another example would be that of applying the fluidity test to indicate the consistency of metal quality on a day-to-day basis, and relating it to scrap and defective casting returns. In foundries where fluctuations in the type of charge or melting technique are frequent, the fluidity test could be used as a guide for quality fluctuations. Other possible uses of the fluidity test could be predicted.

Whilst the question of using fluidity testing for research and metallurgical studies remains unchallenged, the question of application of fluidity testing on the foundry floor requires a fresh approach. Whilst it is unlikely that fluidity testing would find a general acceptance in foundries, it is even more unlikely that the test will fall into oblivion in foundries. It is hoped that the present Paper has shown that some useful uses of the fluidity test on the foundry floor are already possible and that the list of such applications is likely to grow with further studies of the subject.

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[1] A. I. Krunitsky, *Trans.* Amer. Found. Soc., 1953, **61**, 399.
[2] K. L. Clark, *Proc.* I.B.F., 1945.
[3] Giesserei-Kalender 1954, 200.

Vote of Thanks

MR. H. MORROGH, proposing a vote of thanks, said it was often alleged in this country and sometimes justly so, that there was a very wide gulf between the activities of the University research departments and industry. Dr. Kondic had discussed the problem of filling moulds which, it would be agreed, was the main job of foundrymen. It was often said that the University research worker was too theoretical and that his discussion could only very infrequently be followed by the foundry worker. Dr. Kondic, he thought, lectured from time to time on the subject of thermodynamics. It would be likewise agreed that he had shown that he, at least, as a representative of the Department of Industrial Metallurgy, of Birmingham University, had given very considerable thought and consideration to the very practical considerations which confront foundrymen. He had considered the various forms of fluidity testing and had been very critical of the spiral fluidity test, which was a common one, and a test from which much useful information had been obtained.

Dr. Kondic had defined fluidity as the ability of metal to fill moulds and his test, in common with the spiral test, was, in fact, a mould which was difficult to fill and he measured the ability of the metal to do so. He had touched upon the rather obscure question of metal quality, which no doubt would eventually lead to a fruitful discussion, but he had emphasized very well the important part played by metal composition and temperature in determining the ability of metal to fill moulds.

MR. MORGAN seconded and the vote was warmly accorded.

DISCUSSION

MR. G. R. SHOTTON said Dr. Kondic's description of the test he had originated was most interesting and he could not help but admire the care with which his experiments were carried out. He wondered if it would be fair comment to ask if the same care had been exercised with regard to the spiral test, the results from it would have been more

comparable with those of the Author's test? The Author mentioned dynamic considerations as affecting the spiral test and the speaker asked for some elaboration.

DR. KONDIC said he had made the point that if the spiral test was in the hands of a laboratory man with all the precautions he could take, he could get good results, so that he did not see any danger of the spiral test being forgotten in metallurgical laboratories. However, the spiral test did require all sorts of precautions from the point of view of getting good reproducibility. With half-a-dozen tests, there was a certain scatter; if this information was passed to a foundry to do some experiments and the tests were compared, the foundry should get the same order of scatter. From information gleaned, the operator's contribution in conducting the spiral test was so large that it wiped out completely all the value of the test. As far as foundry control was concerned one could still get the effects of larger changes of composition and temperature, but it was well outside the point of showing changes in metal quality, a desirable feature of the fluidity test. With the utmost care it was possible to get the highest accuracy, but this was not feasible in the foundry.

His department had tried to develop a test which could be relied upon to give good results when carried out by independent operators under the same conditions. It had been given to students many times to make moulds and measure temperatures. Independent results were well within $\pm \frac{1}{4}$ in. He maintained that one could not get that with unskilled operatives using the spiral test. That was the distinction between the two tests. All sorts of devices had been suggested for the spiral test whereby one could get round this; his answer to this was that if a test was made so complicated, foundryman would not look at it.

Measurement

MR. H. G. HALL said the Author had stated emphatically that one could be within $\pm \frac{1}{4}$ in. on the measurements. He would like to know how one could measure within $\frac{1}{2}$ in. on 6 strips. Was he not measuring to $\pm \frac{1}{12}$ in. on each strip; could that be done?

DR. KONDIC said he carried a little rule with which he measured the length to the tip of the strip. Some alloys gave very perfect tips. He measured them all from the pouring well. The two aspects of influence of temperature and quality were demonstrated so obviously by the "star" test that there was no need to measure the strips.

MR. E. HUNTER said he had gained an impression that the effect of gases had been said to have little or no effect on fluidity. He would suggest that that was rather contrary to personal experiences with irons with low-carbon and low-phosphorus content. He had found, over a number of years, that a gassed iron was associated with very low fluidity, even with the temperature and composition constant and that had been proved by vacuum-fusion tests on the metal. Had the Author any observations to make on this aspect?

DR. KONDIC said he was grateful to Mr. Hunter for his comment because that was the sort of information he sought. He was very glad Mr. Hunter had found gases did affect fluidity, that was what he had been saying. The only difference between the statements was the question of defining the state of gas. This was very elusive and one had to be very precise. When he said gas in metal, he meant gas which would come out as gas when it left the metal and the natural example of that was hydrogen. He could think of no other gas in castings which came out as gas without reaction. When oxygen came out it did so as moisture or as carbon-monoxide and therefore this was defined as a reaction gas. When he referred to impurities, he usually implied the gases mentioned, but when he said gas he meant those which came out of solution on their own, but to all intents and purposes oxygen in cast iron was an impurity.

Variables

MR. MORROGH said the British Cast Iron Research Association had spent a very considerable time studying the influence of what they believed to be variables on fluidity. They had, unfortunately, used the spiral test, but Dr. Kondic has said that if it was done carefully it was probably nearly as good as his. He thought the BCIRA tests were done very carefully. Apropos of Mr. Hunter's remarks, he would like to point out that the BCIRA had also studied the influence of gaseous elements, in particular, oxygen. Oxygen content was found to have no influence on fluidity as measured by the spiral. Perhaps Dr. Kondic might like to suggest why these results differed from those obtained by Mr. Hunter.

MR. HUNTER said he tried the spiral tests and obtained all sorts of results.

DR. KONDIC said he was present on the occasion when Mr. Evans of the BCIRA presented a Paper to a conference of foundrymen at Ashorne Hill and had made the point Mr. Morrogh had just stated, namely, that as far as his evidence went—and he believed that Mr. Evans took the trouble to go into foundries and try all sorts of methods and tricks to get oxygen into the iron—he just could not get any effects. However, there were about half a dozen who disagreed with that and criticized Mr. Evans: this inclined him to suspect that there must be something hidden, because, quite frankly, if six foundrymen said one laboratory man was wrong, then he was on the side of the foundrymen. There must be something in it, and he was sorry to say he had not had time to study that particular variable.

MR. HALL said he supported Mr. Morrogh on this, after all, a number of foundrymen had expressed the opinion at Ashorne Hill, but he confessed that as a result of the work that had been done there was no evidence to show that oxygen affected the spiral test. Certainly there was evidence that melting under oxidized conditions affected residual elements, but all attempts deliberately to produce oxidized metal containing a quantity of oxygen had not revealed any alteration of spiral length. He appreciated the efforts Dr. Kondic had made in this direction. For many years, he had considered the spiral test, but

having tried it he had given it up as being too critical and giving too many erratic results. In fact now, even after hearing the lecturer, he would be inclined to say that if he accepted his evidence he would still regard fluidity testing as a post-mortem test. He thought its value would probably surely lie there; it might be relatively easy to take such a test with cupola metal but with a batch furnace it would be difficult.

Mould Characteristics

DR. KONDIC said that, given an intricate mould and using the same alloy and temperature with everything else being controlled as far as possible the mould would be better or poorer according to the type of sand; so the question of test-mould material entering into the fluidity test simply meant that one must try to use the same type of sand for any given series of tests. He had tried coarse, fine and mixed sand and found what one would expect, namely, going back to some of the IBF sub-committee work on core-sand, one obtained greater chilling power and therefore shorter strips. If one was interested in metal fluidity one must not change sands. Sand certainly did affect fluidity, as also did different types of mould dressing.

MR. TAFT supported Mr. Hunter because as a foundryman he was interested in making castings for which good fluidity was essential. He used to say that certain spiral-test results would forecast a lot of misrun castings. He had given up saying anything about oxidized iron, but thought there was some gas effect which tended to throw the desired properties out of balance. A peculiar position could be reached where one could take many tests and yet make a whole pile of scrap, then there must be some change in the metal. These peculiar conditions arose sometimes and even a temperature check would not give what Dr. Kondic was after, that was an estimation of the capacity for complete filling of a mould.

DR. KONDIC said that, like Mr. Taft, he still had an open mind. Mr. Evans had shown that the spiral test did not show up quality difference due to oxidation, but he still believed that some other test might. He was not questioning Mr. Evans' results but would rather not make definite deductions from the spiral test. Maybe this point would be resolved by some other test.

MR. TAFT said that certain conditions of cupola operation could be provided to cause "oxidation" trouble; over-blowing was one of these.

MR. SHOTTON said another point worthy of consideration was that some work Dr. Kondic had carried out on re-melting showed a reduction in fluidity on repeatedly melting. This was something that had been observed in practice. However, there must be some causatory factor which required investigation. When melting low-carbon white iron, founders experienced times when there was lack of fluidity. Sometimes it had been chronic and had been cured by complete revision of the charge make-up.

Oxidized Iron

MR. J. L. FRANCIS said he was extremely interested in the so-called problem of oxidized iron and as a result of some years of experience he was convinced that what was called oxidized iron was definitely inferior in its properties to iron which had been melted under proper conditions of cupola operation. It seemed to him that the oxidizing conditions, or so-called oxidizing conditions, took place when the cupola was run improperly, notably when too-low a coke bed was used, and melting occurred too near the mouths of the tuyeres. One obtained a condition which was not the same as stirring oxide into molten cast iron in a crucible. Whether it was a direct effect of oxidation or the subsidiary effects of other changes which took place due to these conditions of melting might be a debatable point. However, the fact remained, as Mr. Hunter and Mr. Taft had confirmed, that what was termed oxidized iron, although it came out of the furnace with ample temperature, did not have the proper "life" or power of filling the mould completely. Therefore, it was much more liable to give defects from entrapped gas; also such iron was more sensitive to chilling.

MR. MORGAN asked Dr. Kondic if he had thought of trying silver in respect of its absorption of oxygen. He wondered whether that would offer him any evidence. He understood that the Author had previously used steam introduced into aluminium, but as silver had a very high affinity for oxygen absorption it might give interesting results.

Analogous Cases

DR. KONDIC said quite frankly he would not like to try silver because gas came out from this metal with such violence that the results would be very difficult to reproduce. Commenting on members' remarks on impurities in cast iron, whilst he personally had no experience in this direction, the only way he could melt grey iron would be in a high-frequency furnace. He could tell of some similar effects with non-ferrous alloys which made him suspect that there was something in this question of oxidized iron after all. One example which was particularly interesting was the question of a zinc/tin system. These systems were interesting because they had one thing in common with oxygen and iron. Tin was very liquid, but showed hardly any solubility in zinc. This was interesting from the point of view of seeing what happened with fluidity. If one took a fluidity test on zinc and added small amounts of tin, which did not dissolve in it, the most striking results were obtained. The fluidity of the zinc was 40 or more inches but if only 0.01 per cent. of tin was added the fluidity of zinc decreased to 20 in. so he was quite prepared to believe that the elements mentioned even in quite small percentages, could affect the fluidity of cast iron.

ANTI-ATTRITION METAL COMPANY, LIMITED—For the year to July 31, 1955, the dividend recommendation of 7½ per cent. compares with 5 per cent. paid in 1953-54.

New Year Honours

Given below is a further list of awards announced recently :

ORDER OF THE BRITISH EMPIRE

OBE

MR. Z. T. CLARO, Chief Industrial Relations Officer, Ministry of Labour and National Service; MR. F. J. COWLIN, chief engineer of the steam turbine division of the English Electric Company, Limited, Rugby; MR. H. J. DOWDEN, senior principal scientific officer, Department of Scientific and Industrial Research; MR. D. G. DUFF, Lubricating Oil Adviser, Ministry of Fuel and Power. MR. FRED GREENWELL, late secretary of the British Coking Industry Association; MR. FREDERICK HEAP, a director of Frederick Braby & Company, Limited, and chairman of the Association of Steel Drum Manufacturers; MR. A. A. HOWGRAVE, principal inspection officer, packaging, of the Inspectorate of Electrical and Mechanical Equipment, Ministry of Supply. MR. W. J. HUGGETT, manager of the marine department (carrier equipment) of the Fraser & Chalmers Engineering Works of the General Electric Company, Limited; MR. T. H. KERNOHAN, secretary of Engineering and Allied Employers' (Northern Ireland) Association. MR. J. K. MCKENDRICK, general manager and secretary of the Tyne Improvement Commission; MR. HERBERT PARISH, chief engineer of Henry Wiggin & Company, Limited, nickel and nickel-alloy manufacturers, of Birmingham; MR. F. H. PERKINS, education officer of Imperial Chemical Industries, Limited; MR. H. J. PERRINS, Senior District Inspector of Mines and Quarries, Durham Division, Ministry of Fuel and Power.

MBE

MR. K. H. BEALE, dry dock manager, Smith's Dock Company, Limited, South Bank (Yorks); MR. FRANK BINGLEY, general manager, Dallow, Lambert & Company, Limited, pneumatic dust-control equipment manufacturers, of Leicester; MR. ARTHUR BOWEN, mechanical engineer, British Thomson-Houston Company, Limited, Rugby; MR. R. C. BUTTERS, chief machine progress superintendent, English Electric Company, Limited, Stafford; MR. J. S. CURPHEY, steel plant manager, Dorman Long (Steel), Limited, Middlesbrough; MR. G. E. DREWETT, divisional superintendent, Westinghouse Brake & Signal Company, Limited, Chippenham; MR. R. G. GOUK, factory manager, Huntley, Boorne & Stevens, Limited, tin box makers, etc., of Reading; MR. E. T. GRATTIDGE, chief engineer, John M. Henderson & Company, Limited, engineers and ironfounders, of Aberdeen; MR. JOE HAIGH, draughtsman, Whipp & Bourne, Limited, manufacturing electrical engineers, of Rochdale (Lancs); MR. A. W. HANTON, divisional organizer, Amalgamated Engineering Union, Glasgow and West of Scotland; MR. S. J. HAVARD, trade union vice-chairman, West Wales Committee, Welsh Board for Industry; MR. ROBERT HAWORTH, chief draughtsman, Santon, Limited, switchgear and water-heater manufacturers, of Newport (Mon); MR. ARTHUR IBBOTSON, chief draughtsman, plant department, Metropolitan-Vickers Electrical Company, Limited, Manchester; MR. DANIEL LEWIS, district secretary, Amalgamated Engineering Union, Newport District; MR. W. S. MARTIN, chief inspector, Brown Bros. (Aircraft), Limited, Northampton; MR. ALFRED O'SULLIVAN, service manager, S. G. Brown, Limited, instrument makers, of Watford (Herts); MR. D. C. ROGERS, section head, Standard Telephones & Cables, Limited, Ilminster (Somerset); MR. W. R. ROSE, chief mechanical designer, General Electric Company, Limited, telephone works, Coventry; MR. C. E. WHITE, assistant general manager (production), Brooke Marine, Limited, Lowestoft; MR. H. C. WILLIAMS, lately fitting shops manager, the Bristol Aeroplane Company, Limited; MR. J. G. P. ZIEROLD, technical manager, Briggs Motor Bodies, Limited, Dagenham (Essex).

BRITISH EMPIRE MEDAL

MR. NORMAN BAXTER, electrical tester, Metropolitan-Vickers Electrical Company, Limited, Manchester; MR. HORACE COLE, toolroom foreman, Joseph Lucas (Batteries), Limited, Birmingham; MR. THOMAS KNOX, chargehand, R. & H. Green & Silley Weir, Limited, shiprepairers, engineers, etc., of London, E.C.3; MR. JOHN LEWIS, assistant mill foreman, Gorse Galvanizing Company, Limited, Llanelly; MR. ARTHUR MCGOWN, foreman of plumbers, Harland & Wolff, Limited, Southampton; MR. J. W. MCIVOR, electrician, Imperial Chemical Industries, Limited, Billingham Division; MR WILLIAM MAXWELL, chief occupational supervisor, Hillington Industrial Rehabilitation Unit, Ministry of Labour and National Service; MR. CHARLES MOULT, senior engine erector, Crossley Premier Engines, Limited, Nottingham; MR. L. F. STOVIN, chargehand fitter, J. S. Doig (Grimsby), Limited, engineers and ironfounders; MR. REX STRACEY, ship plater, Mercantile Dry Dock Company, Limited, Jarrow; MR. A. A. E. TATMAN, chargehand, Enfield Cables, Limited; MISS MAUD UNWIN, fettler, Dewrance & Company, Limited, valve manufacturers, etc., of London, S.E.1; MR. EDWARD YATES, foreman electrician, Beyer, Peacock & Company, Limited, locomotive engineers, etc., of Manchester.

Social Security Agreement

A reciprocal agreement on social security between the United Kingdom and New Zealand was signed in Wellington on December 20 last and will come into operation on April 1, 1956. Under it, the Ministry of Pensions and National Insurance will treat people who come to the United Kingdom from New Zealand as if they had paid contributions to the National Insurance scheme while they were in New Zealand so as to enable them to qualify for retirement pensions, widows' benefits, and sickness and unemployment benefits. People who go from the United Kingdom to New Zealand will continue, as at present, to receive any retirement pension or widows' benefit for which they may have qualified under the National Insurance scheme. The New Zealand Ministry of Social Security will, however, treat them as if they had been resident in New Zealand while they were living in the United Kingdom so as to enable them to satisfy the conditions for New Zealand benefits and will take into account the amount of any National Insurance benefit to which they are entitled. The agreement also provides for the payment of sickness and unemployment benefits under the New Zealand schemes to people from this country. Anyone who thinks he may become entitled to benefit under the agreement should apply to his local Pensions and National Insurance Office.

Mr. Landegger's Bid for Millspaugh Units

Mr. K. F. Landegger's offer to purchase, at 10s. each, such number of ordinary 2s. 6d. stock units of Millspaugh, Limited, as will make his holding, with that of his friends, amount to 50 per cent. of the issued ordinary capital, has become unconditional. Mr. Landegger is accordingly purchasing stock delivered to him under the terms of the offer of December 22. At that time, his holdings, owned or controlled, totalled a little under 40 per cent. of the capital. The offer of Hadfields, Limited, on the basis of two ordinary £1 shares in Hadfields for every seven Millspaugh ordinary 2s. 6d. units was declared unconditional on December 21 last.

Expansion in Industry

Preliminary results of the 1954 census of production show that the output of UK manufacturing industry in 1954 was worth 15 per cent. more than in 1951. Rather less than 12 per cent. of the increase was due to a larger volume of production and about 3 per cent. to higher prices. As employment increased by under 3 per cent. between 1951 and 1954, there has also been a considerable rise in productivity.

Capital investment in 1954 more than maintained the high post-war level, showing a rise of nearly 10 per cent. over 1951. The *Board of Trade Journal*, in which the preliminary results are given, points out that wages and salaries increased more rapidly than the value of output, being 26 per cent. higher in total in 1954 than in 1951.

The improvement shown in 1954 compared with three years earlier was, the journal states, principally the result of vigorous growth in that year, the index of production for 1953 showing a rise for manufacturing industry of only 2 per cent. compared to 1951. The conclusions reached for 1954 are based on census returns—roughly 70 per cent.—so far received.

The metals, engineering, and vehicles industries and the manufacture of chemicals, which have been the growing points in the economy since the war, continued to show rapid expansion. Price played a part in the increase in gross output in these industries, but it was in general less important than the increase in the volume of production. In metal manufacture the value of output in the melting and rolling section of the steel industry was 35 per cent. more in 1954 than in 1951; while, among the engineering industries, mechanical engineering (general) showed an increase in gross output of 40 per cent., from £764,000,000 to £1,067,000.

Both in 1951 and 1954, says the journal, there was a very high rate of investment in the public utilities, and particularly in the electricity supply industry, where production, though increasing rapidly, expanded less than in some sections of manufacturing industry. In vehicles and engineering, on the other hand, large increases in output have been achieved with an overall level of capital investment which is not so high in relation to their size as in many other industries. A high rate of capital expenditure is, however, found in the other rapidly growing sectors of industry—metals and chemicals.

For manufacturing industry as a whole the increase in wages and salaries between 1951 and 1954 amounted to nearly 26 per cent., or over £700,000,000. Part of the increase in the total was, of course, due to the increased number of people employed, but the rise in the average amount per head for manufacturing industry as a whole was about 22 per cent. Increases of a corresponding size were general in most industries.

Cold-setting Core Technique

By one of those slips (the advertiser's, not the Editor's) which prove us all human, some confusion has been created about the new cold-setting core technique which was recently announced by the Fordath Engineering Company, Limited, of West Bromwich. The advertisers have asked us to permit them to make it clear that Glyso Auto-Hardening Binder and Glyso-Corovit, as it is now known, are one and the same thing. Glyso-Corovit has been developed by Fordath in association with Oel.u.Chemie-Werk, of Switzerland, holders of British patents for cold-setting core-binder methods, and is manufactured and marketed in the UK solely by Fordath.

Scope for Trade with Canada

Businessmen returning from sales tours on the North American Continent are often heard to remark that British manufacturers could, if they so wished, enjoy much more success in their trade with Canada. The Treasury in its latest *Bulletin for Industry* confirms this view, saying that Canada provides undoubted scope for early and substantial increases in UK exports despite the obvious advantages enjoyed in that market by American manufacturers. The Canadian market, the *bulletin* adds, thanks to the, in the main, liberal trade policies, is one of the fairest markets in the world.

It is pointed out that the Dollar Exports Council has drawn attention to the opportunities in Canada, that detailed market reports by UK Trade Commissioners on particular groups of products have been widely discussed, and that a number of important Canadian buying missions have visited this country within the last few years. That the result in terms of shipments has not so far been greater, the Treasury states, "is in part, perhaps, a consequence of the easy selling conditions on the home market, and it is hoped that measures to restrain demand in this country will lead to increased sales in the Canadian and other expanding markets."

The last few months of 1955 saw renewed expansion in the Canadian economy and the fall in output and imports in 1954 had been more than made good by the second quarter of last year. Yet UK exports to Canada have not risen with the total of Canadian imports. The UK has not in recent years secured more than a tenth of Canada's total imports and last year the proportion had been substantially less, although the second and third quarters taken together showed a small improvement over the same period in 1954.

Total Canadian imports of engineering goods have been rising, but the UK share has continued to fall. The most common complaints by the Canadians, it is said, are about the length of UK deliveries. British manufacturers of capital equipment are often unable to match North American dates. There is severe price competition in consumer goods, but on capital goods generally UK prices are acceptable, but the Canadian buyer often prefers to pay more for his equipment rather than to wait.

More Coal Board Staff

As a further step towards carrying out some of the recommendations of the Fleck report on organization within the coal industry, the National Coal Board has begun to advertise a number of positions in its new staff department. For the new posts the board is seeking men of wide experience in managing staff and with some knowledge of training methods. Altogether about 70 positions will be created within the staff department, which will cover headquarters, divisional, and Area levels, and will be responsible for staff recruitment, salaries, and conditions.

Organization and methols officers are to be appointed at salaries starting from £1,620 to £2,170 a year. Eight divisional chief staff officers will be appointed at salaries starting from £1,620 and in some cases reaching £2,500. Area staff managers will number 48, engaged on a scale between £1,270 and £2,170. Staff directors have already been appointed in all the board's divisions except the South-Eastern Division at salaries, it is understood, of about £3,000.

The director-general of the staff department, who works under Sir Andrew Bryan, a member of the NCB, is Mr. J. O. Blair-Cunynghame, who joined the board to take up that post last September.

Foundrymen's Dislikes

Extracts from Mr. F. Hudson's Address, and Discussion Report

A presidential address was expected, but the president chose the unconventional procedure of giving a talk on foundrymen's "grouses," quoting some of his own, illustrating others by films, and inviting contributions to the subject from his audience. The major shortcomings revealed in the discussion related to the problems of recruitment. Nearly all contributions revealed a healthy discontent with the status quo *and resolutions towards the improvement of foundries generally.*

At the opening meeting this session of the London branch of the Institute of British Foundrymen, the past-president, Mr. W. Wilson, took the chair and proceeded with the formal induction of the new president, Mr. F. Hudson, F.I.M., mentioning *inter alia*, that Mr. Hudson was a past-president of the Scottish branch of the Institute, having held that office 20 years ago. (Mr. Hudson was invested with the badge of office by the retiring president.)

Proceeding with the business of the meeting, the president presented a Diploma of the Institute to Mr. A. Talbot for his paper "Moulds and Cores by the CO_2 Process," and then announced the other awards to London branch members which were made at the International Foundry Congress in London in June. These were: the E. J. Fox Medal to Dr. L. B. Pfeil; the Oliver Stubbs Medal to Mr. E. S. Renshaw, and the British Foundry Medal and Prize to Mr. J. M. Langham.

ADDRESS

MR. HUDSON said that he first became attached to the foundry industry in 1917 and for nearly 40 years had been intimately associated with the production of steel, iron and non-ferrous castings in Great Britain and in many parts of the world. In that period, he found much that he liked about the industry and a few things—quite apart from presidential addresses—which he did not like. That night, therefore, he proposed to outline some of his dislikes and hoped members would tell him about theirs. If there was anything wrong with the foundry industry, one must obviously first find the cause before the fault could be corrected.

To make the subject as interesting as possible, he proposed to illustrate his talk by means of sound films, a first necessity being to create the right atmosphere as a basis for discussion.

Key to Progress

Mr. James Blakey, in his presidential address to the Institute of Chartered Accountants, had said:—

> "Prosperity will come only from increased production derived from greater effort. We are not likely to get greater effort if the individuals who made it find that, after taxation, their reward is not worth the effort. Lower taxation, higher production, respect for healthy profits and more freedom to the individual to spend his money as he thinks fit—these are the only sure roads to greater happiness and a real increase in the standard of living."

To-day, and even more so in the future, the key to progress and prosperity, would undoubtedly be found in the more effective use of new methods, machinery, and such mechanical aids as would assist each man and woman to do his, or her, particular job more efficiently and with the minimum of non-productive effort. Could we imagine what living conditions might have been like in this country to-day without the developments which have arisen in the past 100 years?

(Mr. Hudson then projected the film: "Key to Progress," which demonstrated how standards of living had been raised in Britain since the mid-nineteenth century through effective use of machinery.)

In the next 100 years, Mr. Hudson continued, progress would be faster still. Already in the United States there was a foundry producing castings entirely by automatic electronic control, using no labourers, no moulders, no foremen. Every operation was controlled by white-coated button-pressing electronic engineers. That was the outlook for the future, but in the meantime the industry must graduate by making the best use of the new methods and machinery available to-day.

Grumbles

His first grumble about the foundry industry of this country was the still all-too-common attitude of many large firms—that anything would do for the foundry. It would not!

His second grumble, closely associated with the first, was against the conservatism and old-fashioned outlook which persisted in certain sections of the industry. Some founders were reluctant to accept new ideas because they were doubtful of the benefits to be obtained and the manner in which their employees would receive them. Two distinct types of foundrymen were connected with this comment. On the one side were those firmly imbued with the idea that—"What was good enough for grandad is good enough for me," and there was nothing much one could do about them except perhaps to ask—"How is grandad now? Dead and buried?"

On the other hand there were those who really wanted to bring their foundries up-to-date but did not quite know how to go about it. These must be helped as much as possible and there was no surer way of obtaining this help than by participation in the activities of the Institute. A very prominent American industrialist once said—"The

Foundrymen's Dislikes

guy who thinks he is competent to doctor himself by the aid of medical books is apt to die some day of a misprint. It is not ignorance but a little knowledge that is dangerous."

Quite recently, the speaker was asked to advise a medium-size non-ferrous foundry on the installation of suitable mechanical aids and in preliminary discussions was informed by the management that they had already tried to introduce simple equipment but this had not been at all well-received by the moulders. In fact after a very short time the men had refused to use it. This firm employed a large number of bench moulders, and on further inquiry it was found that each moulder had been issued with a pneumatic rammer and at the end of the day the men had been more tired than if they had used the ordinary hand-rammer. He sympathized with the moulders, for in this case management had made a wrong decision, and this brought him to his third grumble.

Works Information

When management decided upon their plans for the future why did they not tell their employees about them? He knew that some firms did but he also knew that many did not. Surely if a man had to operate a certain type of equipment it was as well to find out what he thought about it. (Here the president showed a film entitled "Why Works Information," which provided an amusing illustration of how workers who were left in ignorance of factory policy might lend their ears to rumour, with harmful effects on output. A sensible works-information system, keeping the man at the bench in touch with developments, was the solution to this problem.)

The problem of getting employees into the right frame of mind, receptive and co-operative towards new developments, the president went on to say, was infinitely more important than the installation of new methods and plant, and this matter must be given the time and consideration it deserved if satisfactory results were to be achieved.

It was good to see that the Institute was now taking an active part in trying to improve human relations through the medium of the Foremen's Training Courses. This was a step in the right direction and provided an example that members in the London area might well follow. In the world to-day there was a need for a better understanding between men, and what finer opportunity had London members of obtaining this, than by participation in the activities of the branch. That night there was gathered together members from every corner of the foundry industry, apprentices, moulders, foremen, metallurgists, managers—even the boss himself. To each one he said "Try and get to know each other better."

Economy of Movement

It had been his personal experience that many foundry workers were, quite naturally, suspicious of methods which they did not understand and very often a simple explanation was all that was required to remove that suspicion. The subject of time- and motion-study provided a typical example and the last film he showed demonstrated in a simple way how motion-study could improve efficiency, increase output, and lighten the worker's load. It was called "The Easier Way."

Summing up, by word, and picture, an attempt had been made to show some of the defects in the industry and how they might be corrected. He was aware that there were others but he would like to hear what members had to say so that the story might be complete.

DISCUSSION

Opening the discussion, after an interval for light refreshment, the president said he knew that in the ordinary course of things presidential addresses were never discussed, but his was not an orthodox presidential address. The idea had been to create discussion; to get members to air legitimate grumbles about the industry.

MR. A. TALBOT said the president had shown some excellent films, but he had not touched on the basis of a number of foundry troubles. Machines could be designed to increase productivity, but the machines had to be made. What about the men who had to make them, and the boys who would eventually become the men who made them? That was where founders had to start—with training the boys, and they had to get the boys into the foundry first. As an Institute, members were regarding apprentice recruitment with complacency, while acknowledging that they were all short of moulders. Foundries nowadays were better than when he entered the industry, but not an awful lot—and that he thought was where one of the troubles arose. Psychological approach, works consultation and such like, had their advantages, but members could do more good if they spent some time on the apprentices, training them, keeping them, and even on making them into good moulders.

THE PRESIDENT summarized Mr. Talbot's comments by saying that from his point of view one of the things which the foundry trade was not doing was making sure that it was getting the right kind of lad in sufficient numbers into the industry to cope with future requirements.

Education for the Foundry

MR. A. A. MATTHEWS thought the reason was that the children were not being educated to suit the industry.

MR. TALBOT said they were being educated more than in his day. The Middlesex County Council and the L.C.C. Education Committee included foundrywork in their curriculum today.

MR. MATTHEWS said he was not disputing what had happened in the past, but did not think the authorities were doing their best to educate the children in the foundry industry, but were more concerned with training them for clerical jobs.

That, MR. TALBOT refuted, educationalists were doing their best and were really interested in the trade, but the industry had nothing to offer the boys when they got them, he said.

THE PRESIDENT said he felt that the foundry industry was largely to blame because the right type of boy did not appear to want to enter it. Founders still had not made the foundry a good enough place to work in. It was too dirty; it had not got the amenities of a machine shop. The solution was in the hands of the industry itself—better housekeeping, and more attractive working conditions. If founders did not do this then he did not blame the young men but the industry itself.

Psychological Approach

MR. W. W. BRAIDWOOD said efforts to improve recruitment of foundry apprentices should be directed, not at the boys themselves (who only needed to be shown a foundry to be fascinated by it) but at the parents and particularly the mothers, who were usually intent on seeing their sons in "white-collar jobs". Foundrywork, though it offered great interest and wide opportunity for advancement with good earnings, was often considered by the parents and particularly the mother, as rather lacking in respectability. In the speaker's opinion, the film made several years ago by the Swiss Foundry Association and which was aimed at education of the parents and particularly of the mother, to realize the fact that the foundry industry offered an attractive career to their sons, had shown sound psychology and had made the right approach.

Burn Danger

A MEMBER said this aspect of the subject had always interested him. Founders had heard a lot about getting the parents interested in their boy's future. He had made a point particularly of asking parents to visit his foundry before a boy started, and one of the first questions that was always asked was "Is it very dangerous?" Members had to agree it was a dangerous occupation; did they ever stop to think how many burns occurred in a foundry? Surely something could be done to prevent some of them? In many foundries ladles could be seen which had something which was supposed to be a spout and the pourer had to do the best he could with it. All had seen them—some that dribbled and some that shot the metal out well clear and so on. Some thought could well be given to the type of vessel which founders used for molten metal and also to the type of runner and pouring basin. Foundrymen ought to do something to eliminate the risks of burns that were all too often taken quite unnecessarily. It was almost a joke—"When you have had a hundred burns, you will be a moulder," was the way it was referred to, preventive methods should be applied. Equipment could be tackled to see that it was suitable for its job so that it could always be guaranteed, for instance, when a ladle was poured the metal would enter the runner basin and not bounce out. The same applied to tapping metal at the cupola and botting up. Work had been done on how to bott efficiently with a hand-operated plug stopper, but there was still the danger of a man tapping with other men standing about.

MR. D. E. BARNARD said he had a steel foundry and if there was anything wrong with the ladle spout it was the fault of the man who had lined the ladle. He could assure the audience that in his particular foundry the number of burns throughout the year was very small. It was just a matter of the way the ladle was lined and the spout made up. When pouring over the lip of the ladle there should be no trouble about keeping the metal in a runner cup if the ladle lip was properly formed.

Improve or Close Down

MR. A. R. WIZARD thought the modern boy did not like his mother to talk about his future at all; he liked to hear a little from his father, if his father was connected with the particular trade or profession.

It should be apparent to all, and especially those who ran small foundries—as he did, and not too clean a one—that they must face up to the fact that they were not going to get boys until they had moved out of bad premises. The majority of founders employing 25 to 30 men should realize that they must either close down completely and leave it to the larger firms with appropriate capital to provide the cleanliness and the facilities that were so important to attract young labour these days, or they must themselves instal what was required by the Iron and Steel Foundries Regulations and the "Garrett Report." It should be borne in mind that some aspects of the Regulations and Report could not be implemented, because the people who had formulated the provisions realized that solutions to many of the problems had not yet been found.

To try and get boys into dirty foundries was wasting everybody's time. Mr. Wizard said he himself hoped to move his foundry shortly, and until then he must hold on to what labour he had got and hope to keep it by adopting enlightened management methods very much as had been shown in the film on management. Founders should realize that their men would respond well to good leadership.

MR. TALBOT said Mr. Wizard adopted a defeatist attitude. Even quite small foundries could be kept clean. It was easy enough to buy brushes and whitewash. A dirty shop was only a reflection of the interest one put into the job.

MR. BARNARD said in his particular foundry they had 35 men and he was really proud of the things they were doing. It was quite clean yet he was always trying to get it cleaner. There was no difficulty even in a small foundry in making it clean; everyone could do it. If most foundrymen would tidy up their places and make them a good place to work in instead of being a bad place to work in, they would get plenty of apprentices into the foundry.

MR. MATTHEWS said he was surprised at Mr. Wizard's remarks because, surely, the topic of the president's address was the future? Mr. Wizard had said he was going to move—he knew a number of foundries that were going to move and they were still going to move—but what was he going to do for labour when his present men had passed away? It was the future members were looking to, not the present.

Foundrymen's Dislikes

MR. WIZARD hoped members would not make him the " whipping boy " of the discussion. It was very easy for some to say they could get apprentices and that brooms were cheap, but he was not talking of normal standards of " good housekeeping." When founders went into their non-ferrous shop and come out choking and spluttering, feeling " they would not work in there for a fortune," then, if their consciences were saying that, they ought to give the whole matter of real cleanliness further consideration. He pleaded that the question should not be dealt with in a narrow way. Founders should attend to the sort of things which they were neglecting at present, many of which were mentioned in the Iron and Steel Foundry Regulations.

Apprentices' Own Viewpoint

THE PRESIDENT pointed out that much had been said about the boys, was there an apprentice or near apprentice who was brave enough to stand up and give his view of the matter?

A YOUNG MEMBER, responding to the president's appeal, said he had been educated at a grammar school, so that would cut out the theory of boys being too well educated to enter the foundry industry. He had entered the foundry from school and was now just out of his " time " but was remaining on and found the work very interesting. He was proud to be a member of the foundry industry.

Wrong Emphasis

ANOTHER MEMBER said he had had some experience of education authorities and he could say quite truly that too much emphasis was put on educating youngsters in how to do a job and not enough on the satisfaction of doing a creative job. It was only when that side of foundry work was stressed that he thought they would begin to get somewhere. There was something in creating something oneself which far outweighed any monetary reward, and there was a great dearth of people who were capable of doing just that. That was the trouble—too many people were being trained to do jobs and too few were being trained in creative work.

Reverting to the president's invitation for statements of founders' difficulties, the present phase of the discussion concerned foundrymen, but members should not forget patternmakers. He knew there was a patternmakers' association, but he felt that quite a lot of co-operation in foundry matters should include patternmakers as well. Founders should tell them what they wanted and how they wanted it. Many moulders could " make a hole in their sand," but the best " hole " was made by a good pattern, and good patterns could only be produced if the founders said clearly what they wanted.

Lack of Inspection Records

MR. E. HARWOOD BROWN said he would like to bring the subject around to another sphere of the industry. In a number of small foundries he was amazed at just how far the foundry industry lagged behind the engineering industry in the provision of efficient inspection facilities. The number of jobs, or similar jobs, which revealed the same, or similar faults, time after time, was amazing. Surely a firm should have an executive or a department for the correlation of faults and to decide how to overcome them in the light of past experience (recorded) of similar faults. It was not often appreciated in foundry circles that an efficient inspector can be a great help rather than a hindrance to production.

THE PRESIDENT, summing up the discussion, said that the main topic raised had been the need for getting the right kind of boy into the industry. That largely depended on how attractive for such boys foundrymen made their work and premises. He thought founders had got to go further, much further than they had so far in making the foundry a good place to work in. It had got to be much cleaner; it had to reach the same level as the machine shop or better and with the advantages of shell moulding, CO_2 process and so on, much progress was being made.

Vote of Thanks

MR. J. BAIN said he would like to point out that that night members were " one-up " on the president. Mr. Hudson said he had never enjoyed a presidential address but he was quite sure that the applause would show that the members, at least, had enjoyed one presidential address. The discussion had been on a major " grouse "—the difficulty of encouraging boys to enter the foundry—but the address had provided more to think about than that. Many points had been raised during the evening and members would have much to digest at their leisure. In formally proposing the vote of thanks, he asked the audience to show the president they had really enjoyed his address.

MR. V. DELPORT, who seconded the vote of thanks, congratulated the president on his getting away from the conventional; all the years that he had been a member of the Institute it had been a convention that there should be no discussion following a presidential address. There had been a discussion this year because it was not a conventional address, and the discussion had proved that Mr. Hudson's venture had been a success.

The second point on which he wished to congratulate the new president was that he had been seeking new ways of interesting the younger members of the Institute; it was not easy, but he thought Mr. Hudson had succeeded.

There was one other direction in which the president had perhaps departed from convention. In the Institute of British Foundrymen members were not supposed to discuss working conditions, but many of the remarks made had been useful. There was certainly one way in particular in which the presidential address had been helpful, namely it directed thoughts towards seeking ways and means of improving conditions in the industry. This was of major importance in these times of labour unrest, in which employers had some share of responsibility.

In seconding the vote of thanks, he added his personal congratulations, which he was sure were shared by all those present.

(The vote was carried with hearty applause.)

Scottish Light Iron Castings Review

By our Special Correspondent

Reviewing the year as a whole, it becomes apparent that although founders still had many difficulties to face, the foundries have had their best year for some considerable time in the light iron castings industry in Scotland. There was no recession of trade in the early months of the year—always a difficult period for the industry, and the employment position was much better than had been the case in the spring of the last two years. This revival was an indication of the conditions which were to prevail for the remainder of the year and despite a few minor industrial disputes there has been very little short-time working and the labour position has remained mainly favourable.

With the bulk of the light castings foundries situated in the East Stirlingshire area—at Falkirk, Larbert, Bonnybridge and Denny—there was some anxiety that the large-scale industrial developments at the port of Grangemouth, with the resultant demand for male labour, would intensify the drift by foundry workers away from ironfounding to other work. This, however, did not occur, and the founders were fortunate in reaching an agreement with the oil industries at Grangemouth whereby the latter would not try to attract skilled workers from the ironfounding industry. As it turned out this agreement worked most satisfactorily and helped to ease the difficulties of the iron founders who, in the post-war years, have not only found it difficult to retain the services of their skilled workers but have been additionally faced with the problem of attracting a sufficient number of apprentices to the industry.

This latter problem has been realistically tackled by the iron founders, and it is true to say that throughout the year great advances have been made in the way of improving working conditions and providing amenities for the employees. The employers have, in particular, laid great stress on the training of apprentices so that as they developed mechanical skill they also have an opportunity of acquiring theoretical knowledge of the various foundry processes.

Labour

The apprentice-training schemes have proved extremely successful and this is shown by the enthusiasm with which the apprentices themselves are now regarding their place in the industry, and by the confidence they feel that application and individual ability can earn them rapid promotion in an industry which has long been noted for the fact that even high executive positions are filled by men who have started their foundry careers on the moulding floors or the fitting shops.

When the railway and dock strikes occurred in mid-summer it was at first thought that these would compel the founders to reduce their working week. The strikes, however, did not affect them too seriously for they had sufficient raw materials on hand to enable them to continue with production as usual until normal working conditions were restored. Again, despite the above-mentioned strikes, the stocks of pig-iron—with the exception of hematite iron—rose during the year, and this enabled the foundries to expand their output of finished goods to a level which compared most favourably with that of previous years. Generally there was an even distribution in respect of the expansion of output, and the general rate of advance over 1954 increased. The section of the industry which makes castings for the engineering industry operated at nearly 10 per cent. above the corresponding 1954 level, and similar advances were shown in other directions. One exception was that in the production of iron castings for the railways, there was a considerable decrease, this being due to a lessened demand for castings for permanent way installations.

Competitive Materials

There was general satisfaction in the Scottish foundries over the continued high-level production of building and domestic castings. For example, the demand for baths and rainwater and soil-pipes goods remained constant during the year, despite the fact that cast-iron was meeting with increased competition from alternative materials. Concrete for the manufacture of lamp standards, asbestos for rainwater goods, and sheet metal in place of cast-iron for certain types of cooking appliances were among the alternative materials being used. As a result many of the foundries in the East Stirlingshire area have reacted to this latest position by themselves concentrating on the use of sheet metal for the manufacture of certain of their products, while at the same time stressing that, for certain purposes, cast-iron has the advantage of increased strength and durability.

Far from being despondent about the future of the trade, therefore, the iron founders in the light castings industry are confident that their foundries will be fully employed for many years to come. In fact the position is such that there is even a possibility that new branches of the industry will be considerably developed in the near future, particularly in respect of aircraft and automobile manufacture and other high-duty applications. A good pointer to this is the significant fact that during the year several foundries in the Falkirk area have, for the first time, set up high-duty sections in their workshops.

Europe's Largest Blast Furnace

Nineteen fifty-six will be an important year in the history of the Steel Company of Wales, Limited, for this month the steel division's part in the company's £40,000,000 development scheme "L" will start operation. The plan was launched in 1952 and is designed to increase steel production to an approximate weekly rate of 48,000 tons. Towering over the project is the new No. 4 blast furnace, which, with a hearth diameter of 29 ft. 9 in. and an ironmaking capacity of 10,000 tons a week, is claimed as the largest in Europe and one of the biggest in the world.

Situated on a site south-west of the Margam works, the furnace is equipped with its own stockyard capable of holding 150,000 tons of ore. A total of 1,500 tons of steel and 415,000 bricks have gone into the furnace, which stands 242-ft. high. Its air supply will be provided by the first steam-driven, axial-flow, turbine blower to be used in this country, which is of Swiss construction and has a capacity of 125,000 cub. ft. a minute. Three stoves, each 140-ft. high, preheat the air; they are automatically controlled and the attendant supervises the sequence of operations from a desk in a control room.

Also ready to go into operation are the 90 new coke ovens which are required to provide the additional coke needed by the No. 4 furnace. Warming up of the ovens began in November. They are located between the by-product plant and the Margam melting shop and when in full production they will produce about 9,200 tons of coke a week.

Shipyard Order-books "Healthy"

Britain's shipbuilding order-book now stands at 5,000,000 gross tons, which is equivalent to over three years' output at current levels. Some of the builders of the new large oil tankers have vessels on order for delivery as far ahead as 1961. But besides the large-scale ordering for oil tankers which was a feature of the closing months of 1955, there was a good intake of orders over the whole of last year for vessels of every type. Although the new orders placed in 1955 were predominantly for home account, there is still in the order-book 1,000,000 gross tons for direct export.

A statement on the prospects facing UK shipyards issued by Sir James NcNeill, president of the Shipbuilding Conference, describes the situation as "certainly healthy and encouraging." Sir James points out that all shipbuilding is in the nature of export whether for home or foreign flag because British ships contribute largely to our indispensable invisible exports. This helps us to view in proper perspective the fact that the proportion of direct export work in our UK order-book is less than in the earlier post-war years, mainly because of the shipbuilding revival in other countries often stimulated by financial incentives and in some cases by direct subsidies.

"Shortages and lack of prompt availability of steel supplies for new construction, marine engineering, and shiprepairing now give cause for real concern, but the industry is hopeful that with the help of the appropriate Government departments and through its own direct contacts with the steel trade adequate supplies will be forthcoming," Sir James declares.

Iron-ore Imports

Iron-ore imports in November, and the total for the first 11 months of last year compared with the corresponding period of 1954, are shown below.

From	Month ended Nov. 30.	Eleven months ended November 30.	
	1955.	1954.	1955.
	Tons.	Tons.	Tons.
Sierra Leone	85,780	580,708	642,162
Canada	184,887	900,656	1,319,721
Other Commonwealth countries and Eire	2,772	34,601	15,071
Sweden	420,018	3,845,328	3,723,279
France	58,163	413,031	591,357
Spain	55,439	465,446	740,368
Algeria	122,377	1,945,990	1,998,987
Tunisia	61,300	564,202	770,468
French Morocco	33,880	237,030	242,297
French West Africa	32,077	519,080	445,105
Spanish Morocco	16,910	239,212	190,593
Liberia	28,360	197,782	278,523
Brazil	54,702	432,309	482,357
Other foreign countries	23,350	332,598	427,524
TOTAL	1,180,015	10,707,973	11,867,812

Spheroidal-graphite Iron Castings. Armstrong Whitworth (Metal Industries), Limited, Close Works, Gateshead, 8, Durham, in leaflet No. F 143 illustrate five castings they have supplied, mainly for the marine engineering industries, in s.-g. iron. Included in the leaflet is a statement of the properties of the material and comparisons are given with mild-steel and grey irons. The leaflet is a straightforward statement devoid of any exaggerations, and, by illustrating the castings the firm has supplied, carries much weight.

Federation's President-elect

The British Iron and Steel Federation's president-elect, Sir Andrew McCance, F.R.S., presented his first paper to the Institution of Mechanical Engineers at the age of 20. His first appointment on leaving the School of Mines in 1910 was as metallurgist with William Beardmore & Company, Limited, Glasgow. A year afterwards he was promoted to assistant armour manager, and he continued in that position until 1919, when he was appointed advisory metallurgist to Colvilles, Limited. After undertaking the task of founding the Clyde Alloy Steel Company, Limited, he was appointed the first managing director, and, in 1930, became a director of David Colville & Sons, Limited. In 1944 he was appointed deputy chairman and joint managing director of Colvilles, Limited, positions he still occupies.

Among the many honours Sir Andrew has been awarded are the Bessemer gold medal (1940), Fellowship of the Institute of Physics, and membership of the Advisory Council to the Committee of the Privy Council for Scientific and Industrial Research. He assumed office as president of the Iron and Steel Institute in 1948 and in 1950 was elected president of the Iron and Steel Research Association. More recently he has served as a member of the Iron and Steel Board. He was knighted in 1947.

National Fuel Requirements

In a paper published in the November issue of the *Journal of the Institute of Fuel*, Dr. G. E. Foxwell considers that the pattern of energy supply foreseen in the United Kingdom over the next 15 years might be as follows:—

(1) During the period 1955-65, coal production may reach 250,000,000 tons, but it is not likely to increase thereafter by any significant amount. (2) In the earlier of these years, oil fuel will be sufficient to make up the inevitable deficiencies. (3) The cost of coal is likely to rise and the maintenance of the production of 250,000,000 tons of deep-mined coal will entail heavy capital cost. (4) The use of oil involves costly importation and with a continuance of high industrial activity, this country will henceforth be a fuel-importing nation. (5) By about 1965, nuclear power may be sufficient to displace 5,000,000 to 6,000,000 tons of coal at power stations and, thereafter, increase at such a rate that it will displace 30,000,000 to 40,000,000 tons by 1975. But considerable costs will be entailed, mainly capital cost.

By 1975-80 the fuel available to this country may be as indicated in Table I.

TABLE I.—*Fuel Requirements in the United Kingdom.*

	1975.	1980.
	Equivalent tons of coal.	
Oil fuel	40,000,000	50,000,000
Atomic power	30,000,000	40,000,000
Coal	250,000,000	250,000,000
	320,000,000	340,000,000

The future position regarding supplies of carbonization coal for the manufacture of blast-furnace coke, says Dr. Foxwell, is disquieting and every effort should be made to use lower-rank coals for the manufacture of iron.

SWEDISH PRODUCTION OF PIG-IRON in the third quarter of last year totalled 250,000 metric tons. In addition, 17,200 tons of sponge iron was produced.

Shanks and Ladles

By "Jaques"

"Judge .... awarded .... damages, to a moulder at W.... County Court, July, 1955, in his claims for injuries sustained as the result of the company's negligence. .... The Judge said that, in his opinion, the firm had not paid sufficient attention to reasonable requirements for the safety of employees who had to carry molten metal. For the moulder, Mr. .... stated, that Mr. .... and another operative were carrying a shank of molten metal for casting, he had told the court that because there was not enough room, he had to step on one of the moulding boxes, and caught his trouser on the box handle, "it caused me to overbalance and I dropped the shank," he had said. The moulder's advocate added that the man had sustained burns to his arms and body."

Paragraphs similar to the above which appear from time to time in the Press, are included in accident statistics, and fail to reflect to the advantage of foundries having conditions on a par with those reported.

Obsolescent Pouring Practices

Costs of production and trade competition will sometimes indicate a necessity for an "inquest" on ways and means to increase man/hour value for less hard and dangerous work. Not so many decades ago, half-a-dozen semi-skilled foundry operatives could be had at to-day's price of one, and any moulding shop task which could be man-handled had to be so dealt with; sheer brawn was the controlling factor. There are still many foundries where approximately half the daily routine is occupied in carrying metal in shank ladles and quite a number of plants where putting the cupola blast on, marks the end of that day's productive operations, in order to cast-up the production resulting from the previous four to six hours of mould making. In some cases, two, three, and sometimes four shanks of metal are lined up to pour a heavy type of casting, where there are no overhead handling facilities for molten metal. Moreover, in many of the smaller moulding shops cupola metal is often tapped directly into shanks and carried from the spout to the moulds, with all the attendant hazards of split-second "catching over," in turn, from one shank to another.

The instinct of self-preservation usually keeps metal carriers alert, but sometimes trouble results when the cupola has a faster-than-usual melting rate—just that fraction above normal maximum handling pace—plus a larger-than-standard-taphole, (it does so happen!) with perhaps also a slow-moving man at the end of the bott "stick"! Such man-made circumstances do provide the menace of flying molten metal, where calm and confidence can only be restored by "knocking the wind out" and clearing away the debris to one side, so as to avoid the hazard of foot burns.

Slackness in Supervision

Is this an exaggerated view of what used to be the position and still is sometimes? Not in the least; protective clothing was never heard of. "Come in your dancing slippers" seemed to be the dictum, so that one could move about quicker! Yet, this was when labour was plentiful and receptive to instruction. No wonder even then that young and more progressive minds could see the setbacks and dangers inseparable from such old-time methods! Production was comparatively cheap, and heavy return scrap was not so much a blot on the executive's escutcheon as the fault of the individual moulder who could please himself as to how a job was made. A face-saving discharge for the errant moulder was an easy "get-out," anyway.

Low pouring-temperature was not then considered to be the prolific source of wasters that it is to-day, even when castings requiring extensive machining were poured from shank ladles. It is true, however, that no mechanized pouring system on a "scotch side" light section, could compete with say, three "understanding" mates with hand ladles, who "waltzed" down and poured a long row of gutter moulds with the precision of the old-time Tiller Girls.

Remedial Measures

Fig. 1 shows a change first made some 30 years ago to eliminate the dangerous practice of metal catching at the cupola spout—a scheme then considered a first-class idea but which, to say the least, did not go quite far enough. Metal was tapped at the cupola spout at a temperature of about 1,450 deg. C. into 10-cwt. ladles which, with a $\frac{5}{8}$-in. dia. tap-hole, took approximately three to four minutes to fill. One trip with the ladle backwards and forwards down the line of shanks in turn, quickly used up the bulk of the contents. "Tag ends" and "overs" were poured back into the other shanks, the bearers of which had "just the job to take it." As a three-tons-per-hour cupola melts approximately 1 cwt. per min., for reasonably quick-handling a staff for manning five shanks is the minimum for dealing with the metal, plus at least two men as skimmers. A six-ton "blow" on that cupola would take $2\frac{1}{2}$ to 3 hours from "wind on" to "drop," so that elementary arithmetic shows the advantages of using the self-contained, one-operator, 5- to 10-cwt. ladles.

Shanking Discontinued

Figs. 2 and 3 show the subsequent development of using a one-man-operated ladle both for collecting metal at the cupola and for pouring moulds. An immediate reduction in scrap figures was secured by the adoption of this method and also higher production of castings per operator, because moulders were engaged full time on mould making,

FIG. 1.—*Adoption of a 10-cwt. ladle for distributing metal to pouring shanks, to replace "catching" at the cupola.*

whereas they previously spent part of their time in carrying shanks. "Dirty pouring," previously a well-worn excuse for scrap—yet quite often a justifiable explanation—was rarely mentioned after the changeover had been made. It can be stated with confidence that the high-quality results which developed from the simple system described, may emphasize the possibilities of improvement in other foundries where the traditional system of metal shanking is still employed.

"One-man" Ladles

The self-contained ladles shown in Figs. 2 and 3 were "home-made" and to some extent experimental, but were soon improved in design as experience and needs indicated. The advantage of the skimmer plate (Fig. 2) which converted such a ladle to operate tea-pot fashion was doubtful, because with a pouring lip of suitable shape (as shown in Fig. 4), a solid-metal "skull" forms after once or twice filling and this develops into a perfect pouring outlet similar to a moustache-cup. Where compressed air is available, or power-hoisting is preferred, the ladle can be suspended from a fixed length of track for pouring. The progressive creep and control at any speed is superior to any other type of small ladle hoisting and lowering method. The chain hoist used first as a temporary measure with this type of ladle required two operators.

Later Refinements

The brief historical details in the foregoing may indicate some of the advantages of later developments in one-man pouring units, which, used in conjunction with correct foundry layout, can be rapid, very mobile and reliable. Fig. 4 shows the development of a typical unit. The runner A, should be preferably a large roller-bearing type for easy and definite movement. The ratchet and friction-clutch lever B, permits a quick lowering, controlled by one hand, acting as a brake on the off-set, large-diameter handwheel, provided for both hoisting and lowering. The latter permits one-hand operation during actual pouring. The components shown in detail at C, retain the handwheel in correct position for the pouring stance, in relation to the hand-tilting lever, D. A piece of light-section tubing, drilled and fixed as shown at E, assists in keeping the handlever cool and is preferable to the solid, one-piece bar type.

Balance.

The position of balance with such single-lever, one-hand pouring ladles is most important, a good compromise is for a full ladle to be very slightly top heavy—the degree of top-heaviness, of course, being influenced by the size and shape of the pouring lip, F. A ladle which requires appreciable effort to tilt it when delivering the first hundredweight or so of molten metal can be extremely awkward when about half empty—apart from the swing and extra effort required. A well-balanced ladle is much easier to control and much safer. The dual nature

FIG. 2.—*One-man-operated ladle developed for pouring moulds on a conveyor.*

of the automatic safety catch G, will be noticed, the second "notch" H, preventing a full ladle, when top-heavy, from tilting right over, in the event of retaining bar J, being accidentally released or through an inexperienced pourer letting go the lever in a panic. The latch angle K, provides automatic engagement when the ladle is brought back to normal position.

Pouring Lip.

The shape of the pouring lip is of considerable significance when pouring small castings. It is necessary for this shape to facilitate fast, intermittent pouring of a row of moulds. The deep, narrow-base type of lip shown in the sketch will permit a quick move from one mould runner-basin to the next, irrespective of any "washing about" of the metal in the ladle. "Side waves" or washing-about develop quite easily in a full ladle of metal when it is moved in a jerky fashion, but the metal in a deep, narrow pouring lip is unaffected by the internal movement of the bulk. The steel type of welded-on lip, L, sometimes supplied as standard on proprietary-made ladles, is best used for pouring heavy single castings, but is unsuited for the quick-cut-off and re-start with a full ladle, when pouring moulds set out on rollers, foundry floor or pallet conveyor.

Details.

The ganister-lined, quick-acting, pull-back lid M, provides some heat protection for the pourer, and is a means also of retaining heat in the metal. After a few fillings, the ladle lining becomes incandescent, a factor of advantage in pouring high-duty or steel-mix irons, which lose their fluidity quickly. For clean pouring of high-class work, rectangular runner basins N, have a cleaner and more quiescent delivery to the mould than the scooped, or pressed-in basin-type shown at P. The cut-down shape of the lip, shown at Q, will prevent a ladle being over-filled, it also provides a cleaner and controllable start to pouring, suiting any type of runner-box or basin and both fast- or slow-pouring speed. It should be noted that all the bearings incorporated in the construction of the ladle are subjected to the effects of accumulated heat, therefore, plenty of clearance should be allowed. The use of normal tool-room standards of accuracy for these components may cause a bearing seizure—such a failure usually occurring at a most critical time.

FIG. 3.—*Another view of pouring from a one-man ladle, showing the suspension gear.*

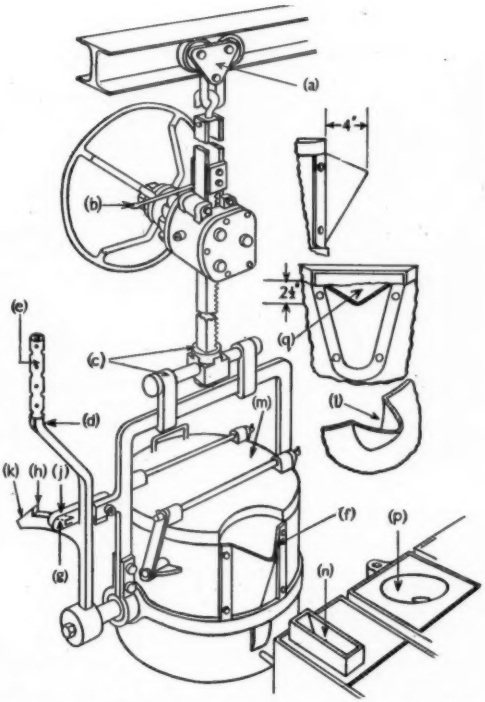


FIG. 4.—*Sketches of the one-man pouring ladle and views of its major components.*

Dust-control Equipment

A leaflet received from Dallow Lambert & Company, Limited, Thurmaston, Leicester, carries twelve pictures of dust-collecting equipment installed in foundries. Whether a leaflet is adequate for introducing such an important subject is questionable. It does, however, show that consideration has been given to tackling the dust problem at the source of production in many foundry applications. It is available to readers on writing to Leicester.

Company News

H. M. HOBSON, LIMITED, aircraft and motor component makers, of Wolverhampton—The company is raising the dividend by 2½ per cent. above the previous year's level with a 15 per cent. recommendation on the £600,000 ordinary capital for the year ended September 30 last. It is the intention of the board in the near future to seek Treasury consent to an issue of ordinary shares which will be offered by way of rights to existing shareholders at a price to be determined.

FRY'S (LONDON), LIMITED, makers of small and hand tools, hacksaw blades, etc., of Southwark, S.E.1—Arrangements are in hand for the marketing of the company's ordinary shares on the Birmingham Stock Exchange. The company has an issued capital of £70,000 of which £20,000 is in 6 per cent. £1 cumulative preference shares and £50,000 in 500,000 2s. ordinary shares. It is understood that about half the ordinary capital will be made available for the market placing.

MARSHALL SONS & COMPANY, LIMITED, engineers, of Gainsborough (Lincs)—An increased turnover was achieved by the company in the year ended September 30, 1955, states Mr. Ashley S. Ward, chairman, in his review with the full accounts. Since acquiring approval by Lloyd's for Class I welding work, the group's boiler department has secured important contracts for heavy steel fabrication work and inquiries to hand show promise for the future. A number of substantial contracts for boiler installations have also been dealt with and the order-book in these sections is satisfactory, reports the chairman.

ARTHUR LEE & SONS, LIMITED, steelmakers, of Sheffield—Mr. G. Wilton Lee, the chairman, states that the "very satisfactory" trading profit and other income of £1,020,780 for the year to September 30, 1955, was arrived at because of "very good reasons." These were full order-books throughout the year; record outputs by every department; a record order load with "almost enough raw material" to satisfy the company, "certainly in quantity if not in quality." All post-war planning and money spent on development had shown up to "full advantage." The subsidiaries, too, had made their greatest contribution.

AVELING-BARFORD, LIMITED, manufacturers of earth-moving equipment, etc., of Grantham (Lincs)—A substantial rise in group turnover in the year to September 30, 1955, is reported by Mr. Edward Barford, the chairman. A slightly lower profit, however, resulted from increased costs and "fierce competition," especially from Germany. After charging depreciation of £115,971 (£91,686), group trading profit amounted to £728,614 (£749,399), plus other income of £7,346 (£12,350), to make £735,960, as compared with £761,749. Orders to date, says Mr. Barford, show a marked increase over last year "and every effort is being made to increase output."

ENFIELD ROLLING MILLS, LIMITED—The directors announce that the offer to purchase the issued share capital of the Watliff Company, Limited, a private company manufacturing commutators, has been accepted by the holders of more than 90 per cent. of the issued share capital. Circular letters, provisional allotment letters, and forms of application for excess shares in connection with the issue to ordinary stockholders of Enfield Rolling Mills of 130,000 ordinary shares of £1 each at 62s. per share were posted on December 30, and dealings in the new shares started last week. The last day for acceptance of provisional allotments and for the receipt of applications for excess shares is January 17.

New Patents

(Copies of complete specifications are obtainable from the Patent Office Sales Branch, 25, Southampton Buildings, Chancery Lane, London, W.C.2, price 3s.)

741,736. Imperial Chemical Industries, Limited, Millbank, London, S.W.1.

A method of brazing titanium or titanium-base alloys to other metallic articles. This is effected by the addition of a bonding material, an aluminium-base alloy conaining from 2 to 7 per cent. magnesium. It is claimed that this gives a joint strength in excess of that attained by, for example, silver solders and aluminium. Patent **No. 741,737** makes similar claims, with the addition of an aluminium-base alloy containing 5 to 14 per cent. silicon as a bonding material.

741,745. Imperial Chemical Industries, Limited, Millbank, London, S.W.1.

A method of melting metals or alloys (such as titanium, zirconium, thorium, molybdenum, hafnium, tantalum and chromium and their alloys) by arc-melting in a liquid-cooled crucible formed of aluminium of at least commercial purity.

741,821 and **741,822.** Imperial Chemical Industries, Limited, Millbank, London, S.W.1.

Improved methods for the arc-welding of copper-base alloys or copper alloys in a protective atmosphere of nitrogen. One of the patents (741,822) provides for improvements in the shielded-arc welding of copper in a protective atmosphere, with special reference to improved filler materials for forming the weld.

741,844. Marvin J. Udy, 546 Portage Road, Niagara Falls, New York, USA.

An improved process for producing metallic iron by reduction of iron-oxide-bearing materials, containing gangue material. A charge comprising the iron-oxide-bearing material, solid carbonaceous reducing material and fluxing material is heated under reducing conditions to a temperature of incipient fusion. This effects (1) reduction of the metallic state of at least a part of the unreduced iron-oxide charge, (2) chemical combination of at least a portion of the un-reacted iron-oxide fluxing material and gangue material of the charge, and (3) the production of a granular, substantially free-flowing product. The granular product of heating and reduction treatment is placed on a surface of a molten slag bath. The molten slag is maintained at a temperature high enough to provide all the heat required by melting the components of the granular production with the production of molten metallic iron and molten slag. The molten metal is then separated from the molten slag.

741,983. Rheinische Roehrenwerke Aktiengesellschaft Mulheim-Ruhr, Germany.

Manufacture of steel articles capable of withstanding the attack of caustic solution in the presence of tensile stress, such as pipes for the conveying of caustic-soda solutions and evaporators for such solutions. A composition would be carbon 0.03 to 0.15 per cent. titanium, tantalum, niobium, zirconium up to a total of 3 per cent., the total amount being such that the carbon in the steel is present wholly as a carbide. Manganese and/or silicon is present in at least an amount necessary for deoxidation of the steel; the balance being iron except for traces of sulphur, phosphorus and other impurities.

Pig-iron and Steel

Demand Outpaces Rising Production in 1955

The performance of the British steel industry in 1955 has been highly creditable. Exceeding by about 250,000 tons the original target of 19,500,000 tons for the year, ingot production has increased by 6¼ per cent. in comparison with 1954 and is now rising so rapidly that the record annual rate of over 21,000,000 tons attained in November is expected to be the norm of 1956. But domestic as well as world requirements have advanced even more rapidly, and in spite of the heavy drain upon the country's external balances, pig-iron, crude steel and manufactures thereof have had to be imported on a scale only once equalled or even approached in the post-war years. In a period of quickening inflation prices have been kept on a relatively even keel, remaining well below world levels, and encouraging advances have been made in technical efficiency and fuel economy.

The higher demand for steel has led to a steady increase in the volume of orders in the hands of British steelmakers. By the end of June these were 70 per cent. above the level recorded 12 months earlier and since then they have continued to grow to embarrassing proportions.

Perhaps the extent of the deficiency has been exaggerated. It has been suggested that even in the most acute periods of shortage an extra 5 per cent. of output would probably have met the domestic demand for most types of steel with the outstanding exception of certain flat rolled products.

Be that as it may, quite early in the year the Iron and Steel Board raised the sights of the steel industry from the revised target of 21,000,000 tons of crude steel in 1957-58 to 22,000,000 tons in 1958, and the Board now expects consumption to rise by 4½ per cent. annually until 1958. If still more steel is needed when the second stage of the development plan is complete the Board believes that it should be possible to squeeze more out of the new plants which will then be in operation, and there should be some margin of flexibility in the volume of imports.

Note of Alarm

But by that time pig-iron and scrap supplies may be exceedingly tight. Of this the industry received a preliminary warning from Sir Andrew McCance during the summer months when he gave a broad hint that steel production might be jeopardized by a shortage of imported ores. That danger, to which the Scottish branch of the industry is peculiarly exposed, because of its greater reliance upon pig-iron, has since been averted. But it is a notable fact that the expansion of pig-iron production during the past year has not kept pace with that of steel.

Over the ten months ended October 31 last, the rise in the output of pig-iron was no more than 523,000 tons, whereas in the same period the rate of ingot production had increased by 959,000 tons. To some extent the deficiency was made good by the more liberal use of scrap, supplies of which have been maintained at a satisfactory level, and the steel makers have also had to resort to the importation of basic iron from Soviet Russia on a considerable scale.

The increased demand for pig-iron, however, has not been confined to the steel industry. The output of iron castings in the first three-quarters of the year reached a total of 2,897,760 tons, representing an increase of 152,130 tons, and these establishments have also had to rely to a limited extent on imported pig-iron.

Owing to a variety of circumstances the number of operative blast furnaces has shown little variation throughout the year and at the end of October remained at precisely the same figure—99—as at the end of December, 1954. Several new blast furnaces of high capacity have, however, been substituted for older and smaller units. At the Appleby-Frodingham iron and steel works at Scunthorpe four new blast furnaces—" the four Queens "—are now operating and in one week a combined output of 27,280 tons was achieved. With a week's output of 11,160 tons one of these stacks, the Queen Victoria, became the first modern furnace in Europe to achieve a five-figure output in one week.

Other blast furnaces of nearly equal capacity are now nearing completion elsewhere and it is hoped that in the near future our dependence on imported supplies of pig-iron will be nearly if not wholly eliminated. In this respect transition from expectation to realization will materially assist the steel industry's efforts to bring production into closer alignment with the ever-rising requirements of home industries and the export trades. In the meantime the Treasury insists upon the importance of a limitation of home demand, for although the country's total exports have been growing, they have not increased fast enough to keep in step with the expansion of the economy.

Examination of the appended tables of production strikingly reveals the restrictive effect of the workers' annual holidays with pay. These holidays are now universally staggered, to enable the works to maintain some continuity of operations. But in these days of a shortage of manpower, the places of workers absent for a brief period can rarely be filled and loss of output was the inevitable consequence.

Curiously, the impact of the transport strikes in June last was a good deal less severe than was imagined at the time. By the improvisation of road transport supplies were kept moving, and though the drop in pig-iron production was substantial, subsequent calculations disclosed that the loss of steel output amounted to no more than 150,000 tons. Even that, of course, was a serious loss when so many industries were starving for steel, and it drives home the lesson that the preservation of industrial

Pig-iron and Steel

peace and the uninterrupted flow of supplies of raw materials is an essential condition of a prosperous steel industry.

TABLE I.—*Pig-iron and Steel Production.*

Month.	Pig-iron.		Steel ingots and castings.	
	Weekly average.	Annual rate.	Weekly average.	Annual rate.
	Tons.	Tons.	Tons.	Tons.
January ..	236,400	12,292,000	380,600	19,789,000
February ..	241,700	12,567,000	394,200	20,498,000
March ..	240,700	12,516,000	394,900	20,536,000
April ..	238,500	12,401,000	393,300	20,454,000
May ..	241,800	12,574,000	401,600	20,884,000
June ..	216,800	11,274,000	364,200	18,939,000
July	230,800	12,000,000	307,700	16,002,000
August ..	236,200	12,282,000	345,100	17,946,000
September ..	246,200	12,804,000	397,800	20,683,000
October ..	249,200	12,957,000	399,500	20,773,000
November ..	252,600	13,135,000	408,600	21,246,000
December*	250,000	12,500,000	372,000	19,750,000

* Estimated.

TABLE II.—*Annual Outputs of Iron and Steel.*

Year.	Pig-iron.	Steel ingots and castings.
	Tons.	Tons.
1936-38 (average) ..	7,568,500	11,722,100
1939	7,979,800	13,221,300
1940	8,204,600	12,975,300
1941	7,392,500	12,312,200
1942	7,725,600	12,941,700
1943	7,186,900	13,031,200
1944	6,736,500	12,142,200
1945	7,107,400	11,824,400
1946	7,761,200	12,695,300
1947	7,784,600	12,724,500
1948	9,276,400	14,876,600
1949	9,498,500	15,562,900
1950	9,632,900	16,292,700
1951	9,668,000	15,638,000
1952	10,728,000	16,418,000
1953	11,175,000	17,609,000
1954	11,883,000	18,520,000
1955*	12,500,000	19,750,000

* Estimated.

TABLE III.—*Pig-iron, Scrap, and Steel Stocks.*

Month.	Pig-iron.*	Scrap.	Steel, all qualities.†
	Tons.	Tons.	Tons.
January	759,000	625,000	828,000
February	712,000	610,000	812,000
March	677,000	591,000	808,000
April	675,000	566,000	844,000
May	655,000	563,000	859,000
June	592,000	561,000	966,000
July	682,000	650,000	999,000
August	811,000	636,000	1,200,000
September	831,000	654,000	1,224,000
October	862,000	684,000	1,163,000
November	891,000	733,000	—

* All stocks of pig-iron at all works including blast furnaces and foundries. It also includes blast-furnace ferro-alloys.
† In terms of product weight.

Price Changes

Having regard to all the facts, the authorized price changes during the past year have been singularly few. Consequent upon the 10 per cent. advance in railway rates the Board sanctioned increases in the controlled home prices of pig-iron which took effect on February 28. These advances were quite small, ranging from 3s. 6d. to 9s. per ton according to grade, and no variation in steel prices was sanctioned either on account of the higher freight charges or the increased cost of pig-iron.

On May 5 the Ministry of Supply made an order increasing the price of cast-iron scrap in most areas. These increases ranged from 2s. to 4s. 1d. per ton and were designed "to encourage the movement of cast-iron scrap between areas of surplus and areas of shortage," being agreed with the British Iron and Steel Federation, the Joint Iron Council and the National Federation of Scrap Iron, Steel and Metal Merchants.

But a revision of the entire price structure of the industry could not be postponed indefinitely. The rise in the cost of production was too serious to be ignored and in authorizing a general advance in prices which became operative on July 25, the Iron and Steel Board largely disarmed criticism by enumerating the four factors which had overcome its reluctance to surrender to inflationary pressures. These were the rise in the price of coal, the increase in the landed cost of raw materials, the rise in railway freight rates, and the general advance in wage levels.

Something less than the whole of these extra costs was passed on to the consumer. Percentage increases ranged from 2¼ to 9½ and averaged 5 per cent. Pig-iron prices were advanced by amounts ranging from 21s. to 28s. per ton, heavy plates by £2 and galvanized steel sheets by £3 per ton.

The extra revenue to the producers was estimated at £32,000,000 and the increased costs at £37,000,000, leaving a net sum of £5,000,000 to be carried by the industry. This, however, was not all loss, since export prices were simultaneously raised by 5 per cent. and the extra premiums obtainable in overseas markets have helped the industry very materially to attain on balance a satisfactory margin of profit.

In November a few minor changes were authorized with the express purpose of putting on an economic basis the manufacture of special qualities of steel which demand rather special care in production, or involve high production costs, and finally on December 19 the Iron and Steel Board issued an Order raising the price of basic, hematite, and other grades of pig-iron by sums ranging from 11s. 6d. to 17s. 6d. per ton.

These increases were the direct consequence of the rise in the freight rates on imported ores. Freight charges had risen about 6s. per ton above 1954 levels and a similar rise is expected in the coming year. The full extent of the price changes during the past 12 months is summarized in Table IV.

TABLE IV.—*British Home Controlled Prices per Ton.*

	January 1, 1955.	December 31, 1955.
	£ s. d.	£ s. d.
No. 3 foundry iron, dd. Birmingham	15 5 3	16 13 3
Basic pig-iron	15 15 6	17 8 0
Hematite (N.E. Coast)	18 2 6	20 2 6
Soft billets	25 5 0	26 19 0
Sections (N.E. Coast)	29 4 6	30 19 6
Bars	29 4 6	30 19 6

Raw Materials

Of major importance is the supply of iron ore and in so far as the UK is dependent upon imported material the arrangement of the necessary transport. Both these tasks call for constant and unremitting

vigilance, and it is a satisfaction to be able to record that mid-summer apprehensions of a grave shortage have been entirely overcome.

In bulk but not in Fe content rather more than 50 per cent. of the ore smelted in British blast furnaces comprises material drawn from our own mines and quarries. In 1954 about 15,500,000 tons of low-grade ore from home deposits were consumed; estimated raisings last year were about 16,000,000 tons, and this output is already planned to rise to 17,500,000 tons in 1959, though the Iron and Steel Board has recently been discussing with the industry the possibility of some further increase.

But home ores generally have a low iron-content —the national average is no more than 28 per cent. against 45 per cent. in the 11,500,000 tons of foreign ore imported in 1954. Home ore is much the cheaper, but smelting calls for a much heavier coke consumption and there are smaller yields from the blast furnaces. Moreover, the advantage of low extraction costs in the Midlands may diminish as open-cast operations near the end of their natural life and more underground mining is undertaken. An even more insuperable difficulty experienced during the past year has been the scarcity of housing and of labour.

In any event the importation and consumption of richer foreign ores is steadily rising. Arrivals in British ports last year may very possibly have reached the record figure of 13,000,000 tons and still more will be needed in the near future, since the industry must of necessity rely principally upon overseas sources for the extra ore required to attain the increase of 35 per cent. in blast-furnace production, which has been planned.

Iron and Steel Scrap

The avowed policy of the British steel industry is to reduce the consumption of scrap towards a level which can be covered by home arisings. The growth of steel production in many countries which formerly exported scrap on a substantial scale has radically altered the pattern of supply and demand. Nowadays foreign scrap is only obtainable—if at all—at high cost and the forward plans of the industry envisage a gradual expansion of pig-iron and a corresponding reduction of the use of scrap in the production of steel.

At present the pig-iron : scrap ratio in the open-hearth furnaces is about 53 : 55, but as additional blast-furnace capacity becomes available it is intended to alter the ratio to 58 : 49.

Nevertheless the calculations of the Iron and Steel Board are that a production of 22,000,000 tons of crude steel in 1958 will require about 10,800,000 tons of scrap, to which must be added the further requirements of the foundries. Approximately half the steelmaking scrap is provided from the steel-works' own arisings, but there remains a balance of 5,300,000 tons to be obtained from other sources.

To the provision of this material and its preparation for furnace use a well organized system is now dedicated. Although the National Scrap Drive under ministerial direction has long since been abandoned, the need for scrap was effectively publicised and has facilitated the work of the private traders, large and small, who are engaged in this essential service.

Obituary

Mr. ARTHUR FIELDEN, chairman and managing director of Lupton & Place, Limited, iron and aluminium founders, of Burnley (Lancs), has died at the age of 79.

Mr. SYDNEY G. LIVERSIDGE, chief clerk of Arthur Balfour & Company, Limited, steelmakers, of Sheffield, has died at the age of 72. He had been with the company for more than 52 years.

The death occurred on January 3 of Mr. F. MANBY, of Skipton, at the age of 73. Mr. Manby was a partner in the firm of Fred Manby & Bros., ironmongers, Skipton, which business has been carried on by the Manby family for just under 140 years.

The death has occurred of Mr. GEORGE LAURIE, senior, at the age of 80. He was employed for 66 years at the Falls Foundry in Belfast, becoming general manager in 1920. He retired from active business in 1946, after spending many years in the United States as sales and technical representative of the company.

Mr. J. ROBERTSON STIRRAT, formerly managing director of Ransomes, Sims & Jefferies (Scotland), Limited, agricultural machinery engineers, died on January 6, at the age of 63. He was co-founder in 1922 of the Morton Engineering Company, Wishaw, from which Ransomes, Sims & Jefferies emerged.

IN LAST WEEK'S "Obituary," the announcement of the death of A. E. McRae Smith included a misprint in the reference to his directorship with Keighley Laboratories, Limited. Apologies are tendered to that firm and others who may have been confused.

Contracts Open

The dates given are the latest on which tenders will be accepted. The addresses are those from which forms of tender may be obtained. Details of tenders with the reference ESB can be obtained from the Board of Trade Export Services Branch, Lacon House, Theobalds Road, London, W.C.1 (telephone: CHAncery 4411, ext. 738 or 771), unless otherwise stated.

PRESTWICH, January 30—Cast-iron manhole covers and frames and gully grates and frames for the 12 months ending March 31, 1957, for the Borough Council. The Borough Engineer, Town Hall, Prestwich.

SOUTH AFRICA, January 13—Brass bar, for the Stores Department of the South African Railways. (ESB/27645/55.)

SOUTH AFRICA, January 13—Phosphor-bronze bar and sheet, for the Stores Department of the South African Railways. (ESB/27646/55.)

SOUTH AFRICA, January 13—Check rail chairs and buttresses, for the Stores Department of the South African Railways. (ESB/27872/55.)

Industrial Output at New Peak

Industrial production in the UK reached a new peak during November last, the index for the month (average 1948 = 100) being 144/145, according to the Central Statistical Office. This represents a rise of between 3½ and 4½ per cent. on the level for the same month of 1954 and is slightly higher than the previous record figure of 142 which was recorded in October last.

It is estimated that the decline in output last month is unlikely to have been greater than is normal over the Christmas holiday period and it seems that the rise for 1955 as a whole will be about 4¾ per cent., comparing with a rise of 6.6 per cent. in 1954 and of 6.1 per cent. in 1953.

Pig-iron and Steel Production

Statistical Summary of October Returns

The following particulars of pig-iron and steel produced in Great Britain are from statistics issued by the British Iron and Steel Federation. Table I summarizes activities during the past six months. Table II gives production of steel ingots and castings in October, and Table III, weekly average production of finished steel. Table IV gives the production of pig-iron and ferro-alloys in October, 1955, and furnaces in blast. (All figures weekly averages in thousands of tons.)

TABLE I.—*Iron and Steel Price Index and General Summary of Pig-iron and Steel Production.*

Period.	Price Index, 1938 = 100.			Iron-ore output.	Imptd. ore used.	Coke to blast-furnaces.	Pig-iron, ferro-alloys prod.	Scrap used in steel prod.	Steel (incl. alloy).			
	I. & S.	Coal.	All comdts.						Imports.[1]	Prod. ingots, castings.	Delivrs. finished steel.	Stocks.[1]
1953	260	350	323	304	207	237	215	188	17	339	262	962
1954	263	364	325	299	234	238	229	198	7	356	277	831
1955—May	269	366	328	313	245	242	242	228	26	402	325	859
June[3]	269	368	331	263	223	221	217	206	31	364	286	866
July ..	272	423	338	294	230	241	231	170	29	308	254	999
Aug.[3]	283	423	338	307	244	245	236	189	36	345	257	1,200
Sept.	284	424	338	333	247	251	246	224	37	398	330	1,224
Oct. ..	284	424	340	334	249	257	249	225	34	399	—	1,163

TABLE II.—*Weekly Average Production of Steel Ingots and Castings in October*, 1955.

District.	Open-hearth.		Bessemer.	Electric.	All other.	Total.		Total ingots and castings.
	Acid.	Basic.				Ingots.	Castings.	
Derby, Leics., Notts., Northants and Essex ..	—	3.8	14.3 (basic)	2.2	0.1	19.2	1.2	20.4
Lancs. (excl. N.W. Coast), Denbigh, Flints. and Cheshire	1.7	34.3	—	2.4	0.4	37.4	1.4	38.8
Yorkshire (excl. N.E. Coast and Sheffield) ..								
Lincolnshire	—	39.3	—	—	0.2	39.3	0.2	39.5
North-East Coast	1.2	75.1	—	1.5	0.5	76.2	2.1	78.3
Scotland	2.6	42.7	—	2.2	0.5	45.9	2.1	48.0
Staffs., Shrops., Worcs. and Warwick	—	19.1	—	1.4	0.7	19.1	2.1	21.2
S. Wales and Monmouthshire	5.1	78.0	7.0 (basic)	1.3	0.1	90.7	0.8	91.5
Sheffield (incl. small quantity in Manchester) ..	10.0	32.1	—	11.4	0.5	51.9	2.1	54.0
North-West Coast	—	1.7	5.4 (acid)	0.6	0.1	7.7	0.1	7.8
Total	20.6	326.1	26.7	23.0	3.1	387.4	12.1	399.5
September, 1955	20.9	325.6	25.1	23.0	3.2	386.0	11.8	397.8
October, 1954	20.9	306.7	23.7	19.7	3.5	363.3	11.2	374.5

TABLE III.—*Production of New Non-alloy and Alloy Finished Steel.*

Product.	1953.	1954.	1954.	1955.	
			Sept.*	August.*	Sept.
Non-alloy Steel:					
Ingots, blooms, billets and slabs[2]	4.7	5.1	5.2	3.9	5.7
Heavy rails ..	8.7	9.6	9.2	6.1	10.3
Sleepers, etc. ..	2.2	1.9	2.4	2.3	1.8
Plates, ⅛ in. thick and over ..	46.5	47.0	49.3	37.4	50.2
Other heavy prod.	43.9	45.8	47.8	40.4	50.7
Ferro-concrete rods, etc.	5.1	5.9	6.4	6.2	7.4
Wire rods and other rods ..	15.6	19.7	22.1	19.3	22.9
Light rolled prod...	44.2	41.2	45.0	38.3	48.6
Bright steel bars ..	6.7	6.3	6.9	6.2	8.5
Hot-rolled strip ..	18.8	21.7	24.2	18.3	26.1
Cold-rolled strip ..	5.2	7.0	7.6	6.7	9.0
Sheets incl. coated	34.1	38.8	41.3	36.8	42.5
Tinplate, terne-plate and black-plate	14.9	16.8	17.5	15.1	18.2
Steel tubes, pipes	20.1	20.0	20.9	18.3	26.1
Tube, pipe fitgs. ..	0.3	0.4	0.4	0.3	0.5
Tyres, wheels and axles	4.4	4.7	5.1	3.9	4.9
Forgings (excl. drop forgings) ..	3.1	2.6	2.3	2.1	2.6
Steel castings ..	4.0	4.0	3.8	3.8	4.5
Tool and magnet steel	0.3	0.2	0.2	0.2	0.3
Total	282.8	298.7	317.6	265.6	340.8
Alloy steel	13.7	13.2	14.4	11.8	16.8
Total deliveries from U.K. prod.[4] ..	296.5	311.9	332.0	277.4	357.6
Add: Imported finished steel ..	6.8	5.0	5.6	17.8	28.4
	303.3	316.9	337.6	295.2	386.0
Deduct: Intra-industry conversion[5] ..	42.6	41.5	45.6	40.2	57.3
Total net deliveries of new material ..	260.7	275.4	292.0	255.0	328.7

TABLE IV.—*Production of Pig-iron and Ferro-alloys during October*, 1955.

District.	Furnaces in blast.	Hematite.	Basic.	Foundry.	Forge.	Ferro-alloys.	Total.
Derby, Leics., Notts., Northants and Essex	25	—	20.7	24.0	0.8	—	45.5
Lancs. (excl. N.W. Coast), Denbigh, Flints. and Cheshire ..	6	—	14.2	—	—	1.6	15.8
Yorkshire (excl. N.E. Coast and Sheffield) ..							
Lincolnshire ..	10	—	37.9	—	—	—	37.9
North-East Coast	20	4.6	50.4	—	—	0.2	55.2
Scotland	9	0.8	16.1	1.8	—	—	18.7
Staffs., Shrops., Worcs., and Warwick ..	7	—	10.3	1.6	—	—	11.9
S. Wales and Monmouthshire	10	4.6	35.4	—	—	—	40.0
Sheffield ..	2	—	3.6	—	—	—	3.6
North-West Coast	9	19.4	—	0.2	—	1.0	20.6
Total ..	98	29.4	188.6	27.6	0.8	2.8	249.2
September, 1955..	99	29.5	186.0	26.6	1.0	3.1	246.2
October, 1954 ..	96	26.7	173.4	26.9	0.4	3.3	230.7

[1] Weekly average of calendar month.

[2] Stocks mainly ingots and semi-finished at the end of the years and months shown.

[3] Five weeks, all tables.

[4] Other than for conversion into any other form of finished steel listed.

[5] Includes finished steel produced in the U.K. from imported ingots and semi-finished steel.

[6] Material for conversion into other products also listed in this table.

News in Brief

BRUSH ENGINEERING COMPANY, LIMITED, Loughborough, paid out nearly £1,400 for its "suggestion scheme" last year.

SAMUEL FOX AND COMPANY, LIMITED, of Stocksbridge, near Sheffield, are spending £320,000 on new grouped engineering workshops.

MR. F. E. MILLS, until recently sales director and general manager, has been made managing director of B.I.P. Engineering, Limited, Streetly, Staffs.

ON AND AFTER JANUARY 16, the North-West England and North Midlands office of Wild-Barfield Electric Furnaces will be 1, Clarkehouse Road, Sheffield.

ACHEMA 1958, the twelfth chemical apparatus and equipment congress and exhibition, will be held in Frankfurt am Main during the period May 31 to June 8.

THE ANNUAL HOLIDAYS for Tyneside and Blyth ship-repair yards this year will be staggered between July 20 and September 3 to avoid a complete shutdown at the yards.

ON COMPLETION of 30 years with the company, 23 employees of Mechans, Limited, engineers, etc., of Glasgow, have each been presented with a cheque for £25.

W. J. HOOKER, LIMITED, 239a, Finchley Road, London, N.W.3, announce that they have been appointed agents for the Badische Machinenfabrik A.G., of Durlach, Germany.

THE ADDRESS of the National Association of Non-Ferrous Scrap Metal Merchants is now Africa House, Kingsway, London, W.C.2. The telephone number, HOLborn 8245, is unchanged.

A NEW FACTORY is being built at Daventry (Northants) by Kneller (Instruments & Tools), Limited, Rugby, for the manufacture of precision tools. Production is expected to begin in the spring.

MR. JOHN GOTHERIDGE, of the Foundry Services, Inc. (Canada), addressing a regional foundry conference at Syracuse, cautioned against the storage of CO_2-bonded cores, saying they should be used on the day they are made.

WORK HAS BEEN BEGUN by Metal Industries (Salvage), Limited, on raising the motorship Cyprian Coast sunk off Newcastle Quay. Under the contract the company has undertaken to complete the task within 28 days. The vessel is of 508 tons gross.

ASTON CHAIN & HOOK COMPANY, LIMITED, non-ferrous metal manufacturers, of Erdington, Birmingham, announce the establishment of a London branch office at 49, Conduit Street, W.1. The new office opened on January 2 with Mr. John H. Randall as manager.

SHEEPBRIDGE EQUIPMENT, LIMITED, announce that they are to manufacture the Schaffer poidometer in England. The poidometer, an accurate feeder-weigher used in mining, milling, smelting, refining and concentrating industries, handles all crushed, granulated and pulverized matter.

THE AMALGAMATION has been announced of two old-established Halifax firms, Nicholson & West, Limited, tool merchants, of Gaol Lane, off Northgate, and Thomas Smith & Company, ironmongers, of Broad Street. The new company will be known as Smith, Nicholson & West, Limited.

DURING 1955, 1,239 workers' suggestions were put forward under a scheme run by Mavor & Coulson, Limited, engineers, makers of coal-cutters, conveyors, etc., of Glasgow. Of these 540, or over 43 per cent., were accepted and for them workers received payments totalling £458 10s., the awards ranging from 2s. 6d. to £49.

EDGAR ALLEN & COMPANY, LIMITED, Sheffield, are making the castings for the manufacture of the largest electro-magnet of its kind in the country; it is to be used at University College, London, for the study of atoms. Over 20 tons of castings are involved, and accuracy to 0.0005 in. is required in the machining of the castings.

A RECORD was established in 1955 by the Ford Motor Company, Limited, Dagenham (Essex), with the production of 356,000 cars, trucks, and tractors in the year. Exports, at 166,000 vehicles to a value of £69,000,000, also constitute a record. Commercial vehicles exported showed an increase of 51 per cent. over the previous year.

THREE EMPLOYERS' ORGANIZATIONS are uniting for a conference to be held at Droitwich, in March, to consider the problem of attaining increased output at a time when the labour shortage makes it impossible to employ more personnel. They are The Federation of British Industries, the National Union of Manufacturers and the British Institute of Management.

THE *Centro Fonderia* of the *Associazone Italiana di Metallurgia* announces that the following officers have been elected:—President, Dr. Mario Barbero (Fiat); secretary, Mr. Giuseppe Zigiotti; members of the executive council, Mr. Giacomo Bargellesi, Mr. Mario Conte (Ilva), Mr. Carlo Longaretti (UISAA), Mr. Mario Noris (Ansaldo) and Mr. Carlo Maria Pensotti.

FOUNDRY TRAINING ARRANGEMENTS of Smith & Wellstood, Limited, and Mitchell, Russell & Company, Limited, Bonnybridge, Scotland, are now under the control of Mr. R. H. Rowse, B.SC., technical director, consequent upon the resignation, on December 31 last, of Mr. R. F. T. Paterson who had been supervisor since the inception of the Apprentice Training Scheme in 1951.

UNDER A SCHEME for which industry is providing the means, the best students of the Birmingham College of Technology will receive money prizes and travel awards. The two outstanding winners of the college associateship—the highest internal award—will each receive 20 guineas given by the Engineering and Allied Employers' Association and the Birmingham Chamber of Commerce.

IN ITS ANNUAL PUBLICATION "Dorman Long Illustrated," Dorman Long & Company, Limited, reveals that a coke-oven plant which, it is claimed, will be the largest in the country, and ancillary works are nearing completion at South Bank; two new blast furnaces at Clay Lane, an electrically-driven cogging mill at Cleveland, and a new medium-section mill are expected to come into operation this year.

OUTPUT OF STEEL INGOTS and castings of the Colvilles, Limited, group, in the year ended September 30 last, was 1,849,610 tons, compared with 1,818,491 tons in the previous year. Pig-iron output was 739,205 (625,936) tons, while coke output was 664,651 (547,054) tons. The output of coke and pig-iron now includes the production of Dixon's Ironworks, Limited, which was acquired at the end of 1954.

PURCHASE ABROAD of industrial plant, machinery, and industrial raw materials are to be greatly increased by India, states the *Government Gazette* on import policy for January-June, 1956. A spokesman for the Commerce Ministry said that plant and machinery

News in Brief

imports were expected to increase from 16 per cent. of total imports to about 20 per cent. in the next half-year. During that period total imports are estimated at £270,000,000.

AT THE FIRST LUNCHEON MEETING of the Non-Ferrous Club to be held in the New Year, the guest speaker was Mr. E. M. Clayson, managing director of the Birmingham Post and Mail. He took as his subject "The Written Word" and gave a delightfully humorous talk on the pitfalls which beset the writer and speaker. On this occasion, the collection for charity was taken on behalf of the Royal Metal Trades Pension and Benevolent Association and realized £17 6s. 6d.

ORDERS for five cargo motorships, the value of which is estimated to amount to £3,500,000, have been placed with British shipbuilders by the Bowater Steamship Company, Limited, a subsidiary of the Bowater Paper Corporation, Limited. Two will be built by William Denny & Bros., Limited, Dumbarton, two at Dundee by the Caledon Shipbuilding & Engineering Company, Limited, and one by Cammell Laird (Shipbuilders & Engineers), Limited, Birkenhead. The vessels are designed to carry pulpwood, woodpulp, and newsprint, and will each have a carrying capacity of about 4,750 tons d.w.

A COMPLETE Clyde-built sugar factory that will withstand earthquake shocks has just been taken over at Turble, Venezuela, after a successful trial period. The Mirrlees Watson Company, Limited, Glasgow, in business since 1840, built it and shipped it overseas. The factory has a daily output of 2,500 tons of white sugar, automatically packed in paper bags. A three-roller mill and engine that the firm installed at Santa Clara, Cuba, in 1851, stood up to 68 years' work and now stands in the yard of a modernized factory as an example of sound Clyde craftsmanship. Six of Britain's eight sugar-engineering firms are located on Clydeside.

GERMANIUM'S APPLICATION in the electrical engineering field is comparatively recent, but its success has had far-reaching results, particularly in small components. Last month, the British Transport Commission completed successful trials of an experimental electric train equipped with a germanium rectifier manufactured by the British Thomson Houston Company, Limited. The rectifier unit, which is air-cooled and of 750-kw capacity arranged for full-wave rectification, is carried aboard the train and it is believed that this country is the first in the world to adopt the new rectifier for converting alternating current from overhead wire to direct current for driving the traction motors.

Secretary Honoured

At the annual luncheon recently of the Sheffield & District Ironfounders Association, a presentation (to which all the membership subscribed) was made to Mr. T. Goddard Mander. It took the form of a silver salver, inscribed as follows: "Presented by, the Sheffield & District Ironfounders Association to Mr. T. Goddard Mander, O.B.E., J.P., in appreciation of his services as secretary of the Association 1920-55." In making the presentation, the president, Mr. S. B. Rippon, paid tribute to the valuable assistance which Mr. Mander had given to the Association throughout the 35 years he had been secretary. At the annual general meeting of the Association, which preceded the luncheon, the appointment of Mr. Frank Hepworth as the new secretary was confirmed.

Personal

LIEUT.-COL. J. B. NEILSON has resigned from the board of Vickers, Limited.

Mr. A. L. SUTHERLAND and Mr. H. C. WHITE have been appointed directors of Philips Electrical, Limited.

Steel Company of Wales, Limited, announce that the Hon. MICHAEL LAYTON has been appointed sales controller of the company.

Mr. GEORGE JONES, general manager of Head Wrightson Stampings, Limited, has been appointed director of the company.

Mr. HUGH R. BYERS, sales manager of Wm. Beardmore & Company, Limited, Parkhead Forge, Glasgow, has been appointed special director.

Mr. L. H. S. HALLING, sales manager of A.P.V.-Paramount, Limited, stainless steel founders, has been appointed to the board of directors of the company.

Mr. GILBERT HUNT, who has been on the board of directors of High Duty Alloys, Limited, since 1951, has been appointed general manager of the company.

MR. JOHN LAING, who celebrated his golden wedding with his wife and family at Polmont, Falkirk, recently, was a bath moulder with the Carron Company for over 50 years.

Mr. H. W. KEEBLE, hitherto chief executive of the foundry division of K & L Steelfounders & Engineers, Limited, of Letchworth, has been made a director of the company.

Mr. F. HOWITT has been appointed foundry manager and Mr. H. WILLIAMSON promoted to the position of assistant foundry manager at Leopold Lazarus, Limited, Birmingham.

Mr. H. L. EVANS has been elected chairman of the Lead Development Association. He succeeds Mr. H. A. SEWELL, who relinquishes the appointment after serving for two years.

Mr. EDWARD G. SMALLEY has been appointed deputy managing director of Tweedales & Smalley (1920), Limited. Mr. GERALD H. LAWES is made an additional director of the company.

MR. H. B. WILLDAY has announced that he is relinquishing the position of managing director of the ironfounders, W. H. Smith (Jackfield), Limited, in favour of his son, MR. G. B. WILLDAY.

MR. ARTHUR WALKER has been appointed managing director of Henry Berry & Company, Limited, hydraulic engineers, Leeds. MR. D. COLEY, chief engineer, has been elected a director.

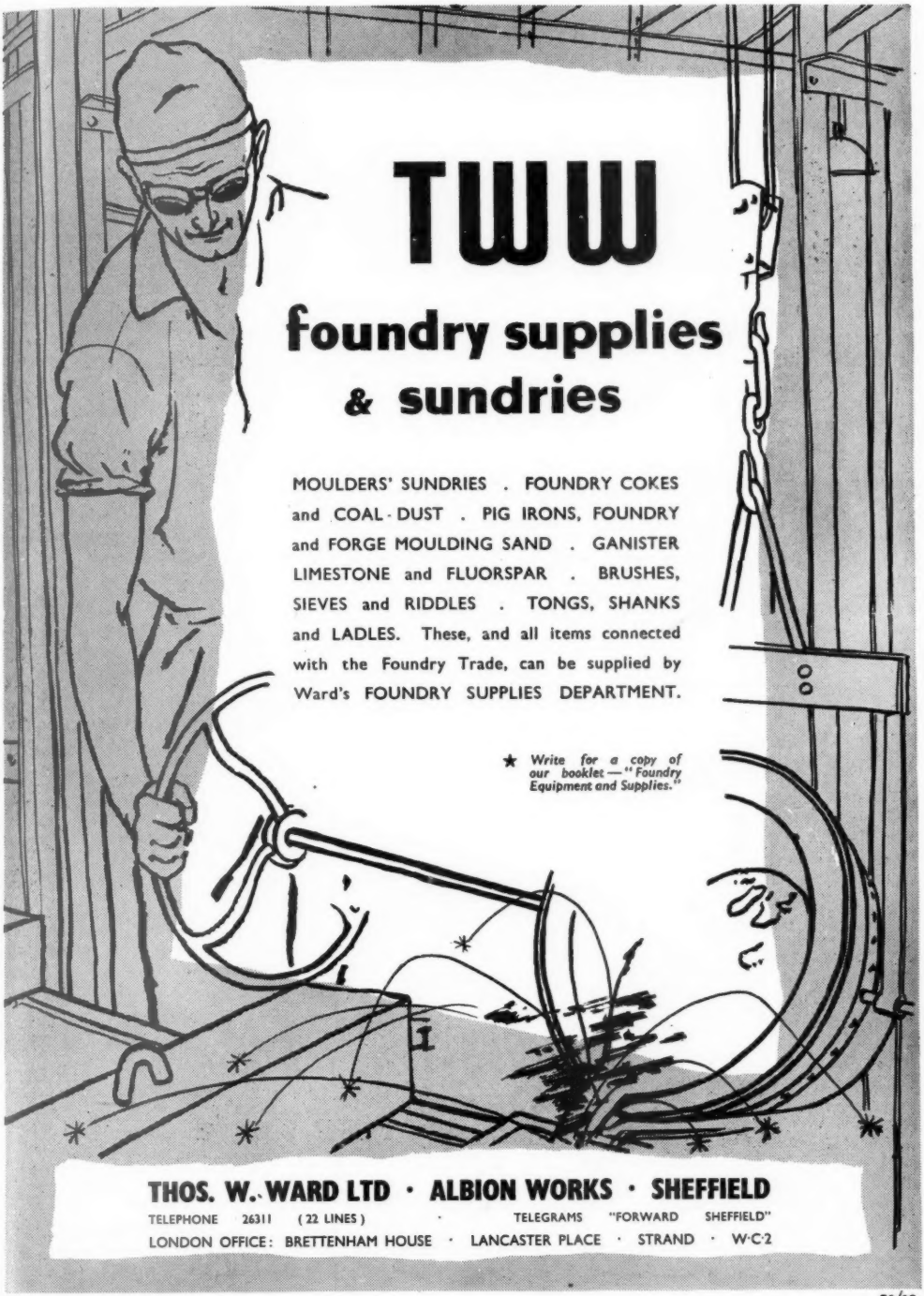
Mr. R. W. FOVARGUE has resigned from the board of Mitchell, Russell & Company, Limited, and Mr. R. F. MAXWELL has been appointed a director. Mr. T. B. PRESTON becomes chairman and managing director.

Mr. JAMES CRAWFORD, president of the National Union of Boot and Shoe Operatives, has been elected chairman of the British Productivity Council. THE RT. HON. LORD CORQUODALE was elected deputy chairman.

Smith & Wellstood, Limited, announce that Mr. ROBERT CRAWFORD, C.A., F.C.W.A., has been appointed vice-chairman, and that Mr. T. B. PRESTON and Mr. J. LIDDELL, F.C.I.S., F.C.W.A., have been appointed directors.

Leyland Motors, Limited, announce that Mr. B. C. BAKER has been appointed sales manager, export division, London. Mr. Baker joined the export division in 1948 and for the last three years has been assistant export manager.

(*Continued on page* 56)



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Personal

(*Continued from page 54*)

MR. TOM BROOME, chief planning engineer, Rolls-Royce, Limited, Derby, aero division, has retired. He has been associated with the firm since 1906, and is a past-president of the Derby section of the Institution of Production Engineers.

MR. J. A. THORNE, of the Brown-Firth Research Laboratories, Sheffield, has been awarded the Fellowship of the Royal Photographic Society—the highest international photographic qualification—for a series of 12 colour transparencies of industrial subjects.

Mr. J. B. MAVOR, chairman of Mavor & Coulson, Limited, mining machinery manufacturers, Glasgow and East Kilbride, has retired. Mr. J. D. LLOYD has been appointed joint managing director, and Mr. R. J. HIRD, director and chief engineer, becomes works director.

The election is announced of Mr. D. P. C. NEAVE, vice-chairman of the Consolidated Zinc Corporation, Limited, as chairman of the Zinc Development Association for 1956. He succeeds Mr. WILLIAM MURE, managing director of the British Metal Corporation, Limited.

Mr. J. BURRELL, who recently relinquished his position as foundry manager at Marshall Sons & Company, Limited, of Gainsborough, to join the technical staff of Vono Industrial Products, Limited, has been appointed works manager of their associate company, Vowles Brothers, Limited.

MR. A. D. MORGAN is relinquishing the position of chief metallurgist to Radiation, Limited, Birmingham, to take up a post in the development department of the British Cast Iron Research Association. He was formerly metallurgist to the Idoson Motor Cylinder Company, Limited, Tividale.

Mr. T. G. QUINNEY has been released, at his request, by the Asquith Machine Tool Corporation, Limited, Halifax, from the board of its subsidiary company, Drummond-Asquith (Sales), Limited, Birmingham, on his appointment as managing director of AMT (Birmingham), Limited, Birmingham.

MR. J. G. LLOYD has been appointed managing director of George Mann and Company, Limited, specialists in offset printing machinery, Leeds, a member of the Vickers group. He succeeds MR. A. H. HIRD, who relinquished the position of managing director on January 1, but retains that of chairman of the company.

Nicholl & Wood, Limited, of Devon Works, Dunkirk Lane, Halifax, manufacturers of foundry studs, chaplets, and foundry requisites, have appointed Mr. JOHN R. S. LOYNTON commercial manager, as from January 1. Mr. Loynton has relinquished his position as manager (requisites) with J. W. Jackman & Company, Limited, Manchester, 3.

MR. JACQUES HENRICOT, of Belgium, has been elected president of the European Committee of Foundry Employers' Associations. At the last meeting held in Dusseldorf under the presidency of Mr. W. Hovelmann, of Germany, there were representatives from Austria, Belgium, France, Holland, Italy, Luxembourg and Spain.

A family party was held on Boxing Day to celebrate the diamond-wedding anniversary of MR. AND MRS. ALBERT ROBERTS, of Lye, near Stourbridge. Mr. and Mrs. Roberts, both 85 years of age, are well known in the Lye district, Mr. Roberts having been in business for over 50 years as an ironfounder and heating engineer.

MR. R. S. GOODHIND has been appointed personnel manager to Newton Chambers & Company, Limited, Thorncliffe Works, Chapeltown, Sheffield, in succession to MR. M. L. CLEMENT-JONES. Mr. Goodhind joined the company in 1951 as transport and traffic superintendent and was later appointed assistant general manager to Thorncliffe Services.

It is understood that Sir John Craig intends to nominate SIR ANDREW MCCANCE, deputy chairman and managing director, as chairman at the annual general meeting of Colvilles, Limited, to be held in Glasgow on January 20. Sir Andrew, who is president-elect of the British Iron and Steel Federation, became deputy chairman and joint managing director of the company in 1944.

MR. W. CLIFFORD LONG, MR. FREDERICK BROWN and MR. THOMAS M. ELLIOTT, special directors of Arthur Lee and Sons, Limited, steel manufacturers, Bessemer Road, Sheffield, for a number of years, joined the board of the company on January 1. They have also been appointed directors of the firm's subsidiaries, Arthur Lee and Sons (Hot Rolling Mills), Limited, and Arthur Lee and Sons (Cold Strip), Limited.

MR. RONALD LEUTWYLER, of the Stanley Works, New Britain, Connecticut, parent company of Stanley Works (Great Britain), Limited, tool manufacturers, Woodside Lane, Sheffield, has visited this country in the course of a world goodwill business trip. He left for Beirut from England on January 1. His itinerary included Europe, the Middle East, the Philippines, Thailand, India, Australia and New Zealand.

WICKMAN, LIMITED, Coventry, announce that MR. GEORGE R. MARSH, managing director, has resigned his office as from December 31, 1955. He will remain a director of the company; MR. EDWARD A. HYDE has been appointed managing director in succession to Mr. Marsh, and MR. W. V. HODGSON becomes deputy managing director; MR. C. F. WATTS is made financial controller and MR. H. B. MORRIS, secretary of the company.

In 1906, "a man and a boy" was the complete staff of MR. HARRY WHARTON, who last week assumed the presidency of the Wharton Crane & Hoist Company, Limited, when he started the firm in two cottages in Longsight, Manchester. By 1933, his company had a large works in Reddish, Stockport; but depression had hit British industry and it was due to the efforts of Mr. Wharton, who is now 88, that the company managed to keep alive.

MR. W. H. HIGGINBOTHAM, chairman of Edgar Allen and Company, Limited, Sheffield, has completed 25 years' service with the firm and figured among the recipients of cuff-links and a money present to mark the achievement. He himself normally makes this presentation to employees but on this occasion he received his award from Mr. H. D. Boyd, a senior director. Mr. Higginbotham joined the firm as secretary and accountant, and became chairman in 1945.

Mr. FRANK SOMERS, senior member of the Halesowen family of industrialists, has been invested as an Officer Brother of the Venerable Order of St. John of Jerusalem for his services to the St. John Ambulance Brigade. Now living in retirement at Barmouth, Mr. Somers was instrumental many years ago in the establishment of an ambulance division in Halesowen. He has been its president ever since. At one time he was superintendent of the Old North Worcestershire Corps of the Brigade. His eldest son, Mr. F. J. Somers, who has always shared his father's interest in the work, is county superintendent.

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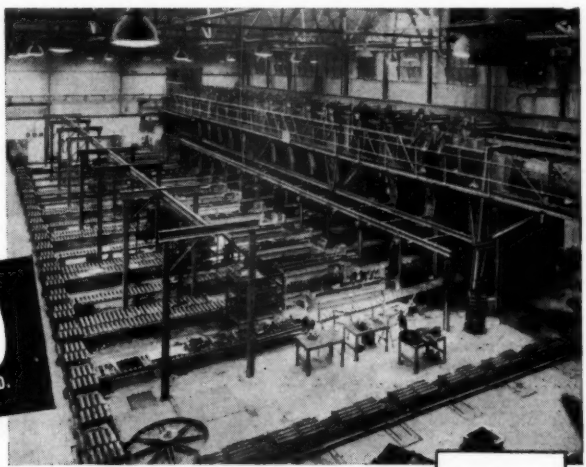

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r13

Raw Material Markets

Iron and Steel

The acceleration of the arrivals of foreign ore ranks as the most favourable development in the iron trade. Imports for 1955 are expected to have exceeded those of 1954 by over 1,000,000 tons and the blast furnaces began the new year with the assurance of ample supplies for the new capacity which will shortly become available for operation.

More pig-iron is already coming into circulation, and the steelworks now count themselves well supplied with basic iron.

The light foundries can get all the high-phosphorus iron they require, but the stringency in the low-phosphorus grades persists. The recent rise in the controlled prices has occasioned concern in the engineering trade, which is now confronted with an application from the unions for a 15 per cent. wage advance.

The high rate of ingot production promises better deliveries of steel semis from British plants and a corresponding release from the re-rollers' dependence on imported supplies. Scarcity of labour has become more pronounced than that of material. Manpower is now the intractable problem. Re-rollers began the year with healthy order-books and reasonably good supplies of material, but lack of manpower tends to restrict production, and although conditions vary in different establishments and different areas, the output of the re-rolling mills in the aggregate is somewhat below capacity limits.

After brief holiday interruptions which afforded opportunities for repairs and overhauls, all the heavy steel mills are now back to normal production and have rolling programmes which will keep them busy for months to come. There is no sign of any abatement in demand.

Shipbuilders have again been voicing complaints on the subject of steel shortages, though plate production is rising and will be further augmented in the near future. Increases in sheet capacity will also be completed very shortly, though this cannot wholly eliminate the need for imports, while the section mills are heavily taxed to meet current requirements without accepting any more orders.

Scarcity of wire rods is a handicap to the wire mills and rail mills are assured of full employment to the end of the half year.

Non-ferrous Metals

Copper is showing a softer trend in London with the resumption of work at the Chilean copper mines. Agreement on bonus payments and other benefits led to the return of the miners at the Chuquicamata and Potrerillos mines and workers at El Teniente followed suit shortly afterwards. The situation has been confused by the call for a general strike and the Government's declaration of a stage of siege. Support for the general stoppage has been indifferent and the copper workers and the railways dissociated themselves from it; early reports indicated that the copper industry would not be further affected.

In any event, a good deal of damage has already been done to the copper supply position. Estimates of the tonnage lost are put at around 30,000 tons and this has been reflected in the United States, where dealers have raised their price to 52 cents a pound for first quarter copper and 49 cents for second quarter metal. One redeeming feature is that scrap copper is coming on to the US market in better quantities at 41¼ cents. Meanwhile, the copper market remains firm on both sides of the Atlantic.

The tin market continues to reflect the shortage of spot and nearby metal in both London and New York. Buyers in both markets remain hesitant at present prices. Unless shipments from Malaya improve rapidly, this situation might continue for some time. According to the latest statistical bulletin of the International Tin Study Group, world mine production in November was provisionally estimated at 14,800 tons, against 15,200 tons in October. World consumption of tin in October decreased to 12,600 tons, compared with 13,100 tons in September.

The higher lead price in the States has taken some of the urgency out of the demand for the metal. How active the American market will become over the next week or two will depend on whether the higher price has achieved its object of diverting Mexican lead from London, to which it had begun to flow when the US price lagged too far behind the LME quotation. The undertone is firm in London and New York, but the turnover has declined.

The long awaited rise in the New York price of zinc took place last Friday, when the level was raised by ½ cent a pound to 13½ cents—this is a step prompted by the need to maintain the interests of foreign producers in the American market. The market is currently firm, but not so active, while an easier trend is apparent in London.

Official metal prices were as follow:—

COPPER, Standard—*Cash:* January 5, £394 10s. to £395; January 6, £388 to £390; January 9, £393 to £393 10s.; January 10, £385 to £385 10s.; January 11, £381 to £381 10s.

Three Months: January 5, £385 10s. to £386; January 6, £381 to £381 10s.; January 9, £384 10s. to £385; January 10, £377 10s. to £378 10s.; January 11, £372 to £373.

TIN, Standard—*Cash:* January 5, £837 10s. to £840; January 6, £827 10s. to £830; January 9, £830 to £831; January 10, £820 to £825; January 11, £812 10s. to £815.

Three Months: January 5, £815 to £816; January 6, £808 to £809; January 9, £813 to £814; January 10, £806 to £807; January 11, £802 to £803.

LEAD—*First half January:* January 5, £124 10s. to £125; January 6, £122 15s. to £123; January 9, £121 to £121 10s.; January 10, £119 10s. to £119 15s.; January 11, £116 10s. to £117.

First half April: January 5, £122 to £122 5s.; January 6, £120 10s. to £121; January 9, £118 15s. to £119; January 10, £117 10s. to £118; January 11, £115 5s. to £115 10s.

ZINC—*First half January:* January 5, £105 to £105 5s.; January 6, £104 10s. to £104 15s.; January 9, £103 15s. to £104 5s.; January 10, £101 10s. to £101 15s.; January 11, £100 to £100 5s.

First half April: January 5, £102 to £102 5s.; January 6, £101 10s. to £101 15s.; January 9, £100 10s. to £100 15s.; January 10, £98 15s. to £99; January 11, £97 15s. to £98.

IBF—West Wales Section

Two films on cupola practice were shown at a well-attended meeting of the West Wales section of the Wales and Monmouth branch of the Institute of British Foundrymen, held at Swansea, on December 8. Mr. R. S. Turner presided. Following the films a paper "Control of Variables in the Cupola," was presented by Mr. G. V. Jones, in which the need for—and practical ways of achieving—strict control of all operations involved, were dealt with. Some very useful information was given on the running of the cupola and the use of frequency charts to assist in keeping metal composition within the specification limits.

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Current Prices of Iron, Steel, and Non-ferrous Metals

(Delivered unless otherwise stated)

January 11, 1956

PIG-IRON

Foundry Iron.—No. 3 IRON, CLASS 2:—Middlesbrough, £17 1s. 0d.; Birmingham, £16 13s. 3d.

Low-phosphorus Iron.—Over 0.10 to 0.75 per cent. P, £19 8s. 9d., delivered Birmingham. Staffordshire blast-furnace low-phosphorus foundry iron (0.10 to 0.50 per cent. P, up to 3 per cent. Si), d/d within 60 miles of Stafford, £19 8s. 3d.

Scotch Iron.—No. 3 foundry, £19 13s. 0d., d/d Grangemouth.

Cylinder and Refined Irons.—North Zone, £21 9s. 0d.; South Zone, £21 11s. 6d.

Refined Malleable.—P, 0.10 per cent. max.—North Zone, £22 6s. 6d.; South Zone, £22 9s. 0d.

Hematite.—Si up to 2 per cent., S. & P. over 0.03 to 0.05 per cent. :—N.-E. of England (local iron), £20 2s. 6d.; Scotland (Scotch iron), Zone S. 1, £20 9s. 0d.; Sheffield, £21 9s. 6d.; Birmingham, £21 17s. 0d.; Wales (Welsh iron), £20 9s. 0d.

Basic Pig-iron.—£17 8s. 0d. all districts.

FERRO-ALLOYS

(Per ton unless otherwise stated, delivered)

Ferro-silicon (6-ton lots and over).—45 per cent. Si, £45 15s. 0d. to £47 15s. 0d., scale 15s. 0d. to 16s. 9d. per unit : 75 per cent Si, £68 0s. 0d. to £71 0s. 0d., scale 16s. 0d. to 16s. 9d., per unit.

Ferro-vanadium.—50/60 per cent., 27s. 6d. per lb. of V.

Ferro-molybdenum.—65/75 per cent., carbon-free, 11s. 0d. per lb. of Mo.

Ferro-titanium.—20/25 per cent., carbon-free, £230 0s. 0d.; 38/40 per cent., £279 0s. 0d.

Ferro-tungsten.—80/85 per cent., 18s. 6d. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 21s. 6d. per lb. of W.

Ferro-chrome (6-10 ton lots).—4/6 per cent.C, £88 10s. 0d. to £95 0s. 0d., basis 60 per cent. Cr, scale 28s. 0d. to 32s. 0d. per unit; over 6 per cent. C, £87 10s. 0d. to £93 0s. 0d., basis 60 per cent. Cr, scale 28s. 0d. to 32s. 0d. per unit; 2 per cent. C,* 2s. 1d. per lb. Cr; 1 per cent. C,* 2s. 1½d. per lb. Cr; 0.15 per cent. C,* 2s. 2½d. per lb. Cr; 0.10 per cent. C,* 2s. 2¾d. per lb. Cr; 0.06 per cent. C,* 2s. 3d. per lb. Cr.

Metallic Chromium.—98/99 per cent., 7s. 0d. to 7s. 6d. per lb.

Metallic Manganese.—93/95 per cent., carbon-free, £249 0s. 0d.; 96/98 per cent., £269 0s. 0d.

Ferro-columbium.—60/75 per cent., Nb + Ta, 24s. to 25s. per lb., Nb. + Ta.

Ferro-manganese (home).—78 per cent., £54 10s. 0d.

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms, and Slabs.—BASIC: Soft, u.t., £26 19s. 0d.; tested, 0.08 to 0.25 per cent. C, £27 19s. 0d.; hard (0.41 to 0.60 per cent. C), £29 5s. 6d.; silico-manganese, £37 12s. 6d.; free-cutting, £31 0s. 6d. SIEMENS MARTIN ACID: Up to 0.25 per cent. C, £34 12s. 0d.; silico-manganese, £36 12s. 6d.

Billets, Blooms, and Slabs for Forging and Stamping.—Basic, soft, up to 0.25 per cent. C, £32 11s. 0d.; basic, hard, over 0.41 up to 0.60 per cent., C, £33 13s. 6d.; acid, up to 0.25 per cent. C, £36 12s. 6d.

FINISHED STEEL

Heavy Plates and Sections.—Ship plates (N.-E. Coast), £33 1s. 6d.; boiler plates (N.-E. Coast), £35 11s. 6d.; floor plates (N.-E. Coast), £34 10s. 6d.; sectional material, N.-E. Coast, £30 19s. 6d.

Small Bars, Sheets, etc.—Rounds and squares, under 3 in., untested, £34 7s. 0d.; flats, 5 in. wide and under, £34 7s. 0d.; hoop and strip, £35 1s. 6d.; uncoated strip mill coils, hot rolled, under 3mm. to 12g., £36 5s. 0d.; black sheets (hand mill), 17/20 g., £46 13s. 6d.; galvanized corrugated sheets, 24 g., £58 11s. 0d.

Alloy Steel Bars.—1 in. dia. and up: Nickel, £58 0s. 3d.; nickel-chrome, £81 10s. 0d.; nickel-chrome-molybdenum, £92 7s. 6d.

NON-FERROUS METALS

Copper.—Cash, £381 0s. 0d. to £381 10s. 0d.; three months, £372 0s. 0d. to £373 0s. 0d., settlement, £381 10s. 0d.

Copper Tubes, etc.—Solid-drawn tubes, 3s. 8¾d. per lb.; rods, 434s. 9d. per cwt. basis; 20 s.w.g., 468s. 0d. per cwt.

Tin.—Cash, £812 10s. 0d. to £815 0s. 0d.; three months, £802 0s. 0d. to £803 0s. 0d.; settlement, £815 0s. 0d.

Lead (Refined Pig).—First half January, £116 10s. 0d. to £117 0s. 0d.; first half April, £115 5s. 0d. to £115 10s. 0d.

Zinc.—First half January, £100 0s. 0d. to £100 5s. 0d. first half April, £97 15s. 0d. to £98 0s. 0d.

Zinc Sheets, etc.—Sheets, 15 g. and thicker, all English destinations, £135 10s. 0d.; rolled zinc (boiler plates), all English destinations, £133 5s. 0d.; zinc oxide (Red Seal), d/d buyers' premises, £113 0s. 0d.

Brass Tubes, etc.—Solid-drawn tubes, 2s. 11⅝d. per lb.; rods, drawn, 3s. 9d.; sheets to 10 w.g., 373s. 0d. per cwt.; wire, 3s. 6⅝d.; rolled metal, 358s. 9d. per cwt.

Brass (Brazing).—BS1400, B3 (65/35), £237; B6 (85/15), £310; BS249, —

Brass (High Tensile).—BS1400, HTB1 (30 tons), £294; HTB2 (38 tons), £302 ; HTB3 (48 tons). —.

Gunmetal.—BS1400, LG2 (85/5/5/5), £337; LG3 (86/7/5/2), £347; G1 (88/10/2/⅛) £422; (88/10/2/1), £413.

Phosphor Bronze.—BS1400, PB1 (AID released), £439 per ton.

Phosphor Bronze Strip, etc.—Strip, 521s. 9d. per cwt.; sheets to 10 w.g., 545s. 3d. per cwt.; wire, 5s. 3½d. per lb.; rods, 4s. 7½d.; tubes, 4s. 5¾d.; chill cast bars: solids 4s. 7½d., cored 4s. 8½d. (CHARLES CLIFFORD, LIMITED).

Nickel Silver, etc.—Rolled metal, 3 in. to 9 in. wide x 0.056, 4s. 6d. per lb.; round wire, 10g. in coils (10 per cent.), 4s. 10½d.; special quality turning rod, 10 per cent., ½ in. dia., in straight lengths, 4s. 9½d. All prices are net.

Other Metals.—Magnesium, ingots, 2s. 4d. per lb. Antimony, English, 99 per cent., £210 0s. 0d. Quicksilver, ex-warehouse, £88 10s. 0d. to £89 0s. 0d. Nickel, £519 0s. 0d. Aluminium ingots, £179 0s. 0d.; aluminium bronze (BS1400) AB1, £376 ; AB2, £390. Solder, brazing, BS1845: type 8 (50/50), 3s. 1d. lb., type 9 (54/46), 3s. 4½d.

* Average 68-70 per cent.